A Pirate Tells All! Page 72

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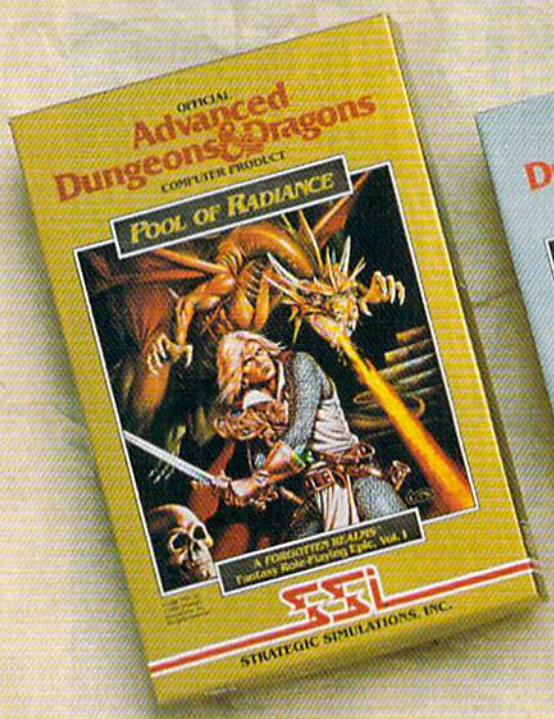

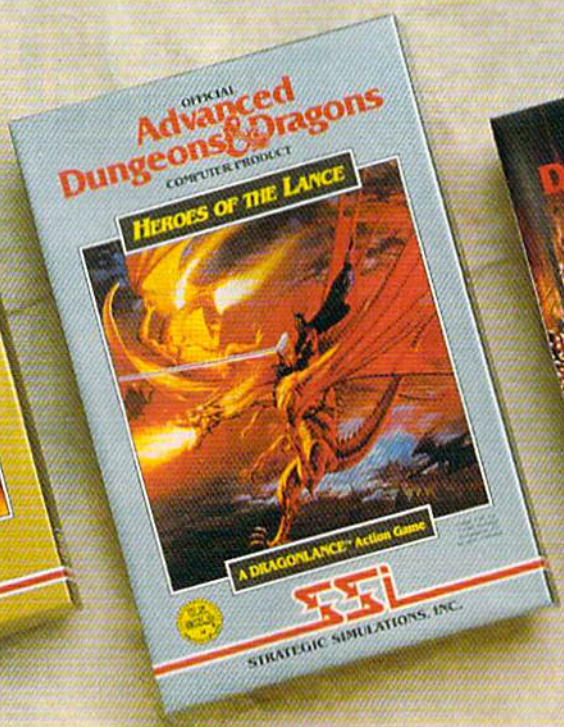

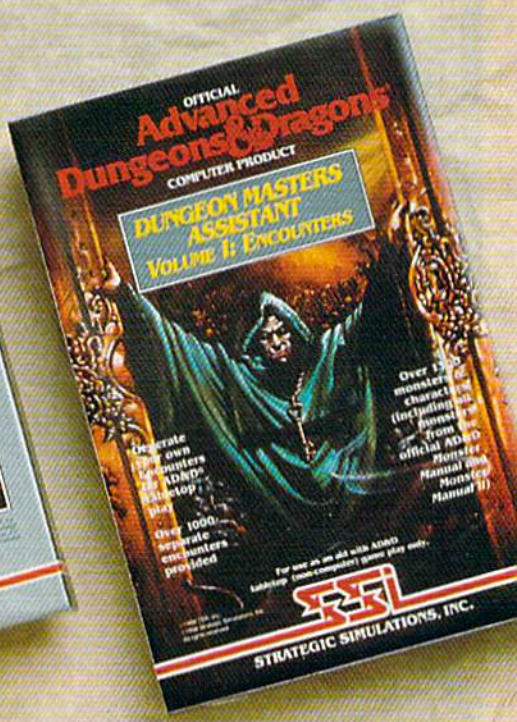

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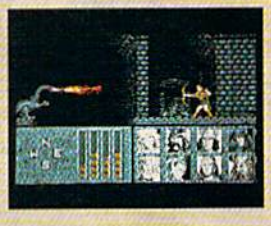

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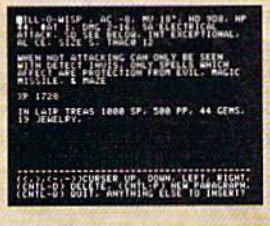

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editor's notes

How far has the personal computer revolution really come? In 1984—the heyday of the boom—some industry analysts sanguinely predicted that by the early 1990s, every U.S. home would have a computer. Now, with the benefit of four years of hindsight, we can see this statement as hyperbole borne of enthusiasm. Yes, personal computing has come a long way in a few years, and it's here to stay. But prognostication is a risky business.

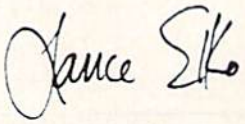
Long-range forecasting is especially chancy in this industry, where technological breakthroughs, changing consumer needs, U.S./Japan trade relations, and the state of the U.S. economy are just a few of the volatile variables that affect the future of personal computing.

But the revolution has in many ways already happened. Personal computers are fixtures in the office. U.S. business would be at a standstill without them. They're slowly, very slowly, increasing in the home market. Currently, 15–20 percent of U.S. homes have personal computers, a modest increase in the past four years, but a long way from the miscalculated 1984 forecast. Computers in education is altogether another issue. Computer literacy has happened in a big way in higher education. Many colleges now require students to have computers. If they don't, they at least provide ready access. There have been efforts made in the public school system—but here's where the computer revolution has suffered the most blatant failure. Sure, there are well-heeled, progressive school systems with state-of-the-art computer labs and dedicated staff. But not every school district has the money or personnel to make the most of computers. In too many classrooms, we have a pretty dismal state of computer affairs.

School budgets are tight, many classrooms are overcrowded, and teachers are overworked. The job of computer education has, unfortunately, fallen to these teachers, many of whom are treading water just to help keep the standard curriculum afloat. They themselves have not been trained, yet they are compelled to quickly become computer-literate, software-literate, and then to translate to students of various skill levels. It's unfair to teachers. And it's a situation of unwanted burdens, so much so that two teachers recently walked out of the profession when presented with computers for the classroom.

The problem is only one of many in U.S. education. The computer industry at large has made some laudable efforts, most notably those of IBM, with the Write to Read program; the Software Publisher's Association, with its annual Computer Learning Month; and Apple Computer, with a history of heavy discounting to schools and continued support. (Commodore's renewed commitment to the education market is worth watching.) In software, Brøderbund, Davidson, The Learning Company, and Mindscape, among others, have developed intelligent, innovative software that works at a variety of primary and secondary educational levels.

Inevitably, today's public school students will be thrust into a college or business environment where computers—and the ability to use and understand them—are prerequisites for successful performance. It's difficult and premature to hope for initiatives from the federal government at this point, before the national election. Regardless of the outcome, good things can happen for our students at state, county, and local levels—at the grass roots, where revolution always begins. If our children are our future, we should consider it a mandate to take an active role in computer education at the home and school levels. We cannot expect more from our overworked teachers. We owe them—and our children—our full and enthusiastic support.



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letters to the editor

Send questions or comments to "Letters to the Editor," COMPUTE!'s Gazette, P.O. Box 5406, Greensboro, NC 27403. We reserve the right to edit letters for clarity and length.

No More Self-Pity

I'm writing in response to the "More on 128D Woes" letters of this column in the September issue.

I'm curious as to why some of those complaining about their 128Ds did not contact the Better Business Bureau regarding Commodore's lack of response in getting their machines fixed. Commodore has to stand behind what it sells or get its hands slapped! If a company has too many complaints regarding what it sells, it is investigated, fined, and, in some instances, required to provide remuneration.

In my opinion, if people stood up for their rights as computer owners and demanded support of their equipment, hardware and software developers wouldn't put out shoddy equipment and buggy programs. We would get quality. Let's get out of this "poor me" syndrome and make hardware and software companies realize that we don't take just "anything" because it's new. Let's do something that will benefit the computer users' community!

Wanda M. Haight
San Francisco, CA

The author is president of CWEST Bay Area Commodore Users.

The Case of the Missing Signatures

My July issue had pages 17–32 inserted six times in the issue. There was nothing else. This is no way to make up for lack of printing material. Once the first section was read, the other five were kind of repetitious. Do I have a unique copy or did they all end up that way? Is it worth something besides the original purchase price? Are you interested in a trade of some kind? In any event, I wouldn't mind having a normal issue.

Antoine Maillet
New Brunswick, Canada

Yes, we couldn't think of anything to put in the July issue beyond 16 pages. But, we figured that in midsummer everyone would be vacationing or sitting at home swooning in the heat, so no one would notice. Our only mistake was to number the pages 17–32 rather than 1–16. You're the only reader who noticed.

Actually, the July issue was shipped normally. But it appears that someone at the printing plant may have, indeed, been suffering from the heat. We ship the magazine in lots of 16 pages (each lot is called a signature*), and the bindery assembles these into a magazine. Apparently, six identical signatures were bound together, and you were the lucky recipient.*

Your copy is probably now worth a fortune, but we're not interested in a trade. You can keep it. We hope you enjoy the normal issue we're sending along.

Millions of Points and Counting

My sister and I have played "Crossroads" (December 1987) a lot and think it is the best game you've ever published. We're way beyond the numbered levels into graphics characters (about level 385), and scores are now 5,179,080 and 6,855,840. Please tell me how to add levels.

Randy Gingery
Cheyenne, WY

We can't tell you how to add new levels, but we can tell you that author Steve Harter has written "Crossroads II: Pandemonium," which includes new mazes and creatures. If you liked the original, you're bound to like this one. We'll have Crossroads II in next month's issue.

The Right RAM Expander

Several members of our users group (myself included) bought 1700 RAM expanders to use primarily with GEOS. The Berkeley manuals indicated that they could be used together. We found, to our dismay, that they cannot. The new GEOS manuals no longer state that the 1700 RAM expanders can be used, but nowhere have I seen it said that the 1700 RAM expanders will *not* work with GEOS. It would be a real service to your readers to inform them of this situation. RAM expanders are expensive, so maybe you can prevent 128 owners from purchasing a 1700 when they need a 1750. Incidentally, Berkeley sells 1750s at an excellent price.

Mary E. Wilson
Clearwater, FL

Better Late Than Never

I waited for months for an article like the excellent one on desktop publishing you ran in the September issue. However, the article said nothing about Timeworks' *Desktop Publisher*. I've heard about this program for almost a year and have seen ads for a long time.

Jeff Rupert
River Falls, WI

We didn't mention Desktop Publisher *in the story because it is not yet available. A Timeworks spokesperson told us that their staff has been concentrating on some other products and that* Desktop Publisher *is slated to appear this coming January.*

Screens on Film

How about an article on taking photos of programs on a monitor?

Dick Randall
Livermore, CA

A full-blown article would be overkill. We take our screen shots using a fairly simple, straightforward method.

To take good screen shots, you'll need a 35mm camera with manual controls for shutter speed and aperture, a tripod, and film (we use Ektachrome 100). First, load your program and display a motionless screen (any moving objects will blur). To stop an arcade-style game, try "Sprite Killer," found on page 79.

Place your camera on a tripod. The camera lens should point squarely at the center of the screen. Focus on that point. Now turn off the room's lights. Set the shutter speed to one second and then take five shots in the f8–f16 range.

If you are using a single-lens reflex camera, we suggest using a lens in the 50mm–100mm range. If you're using a range-finder camera with a telephoto option, switch on the telephoto lens.

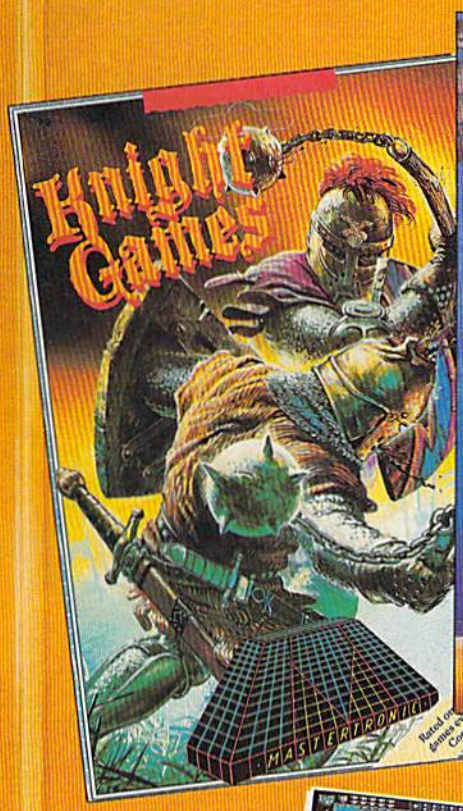
French GEOS

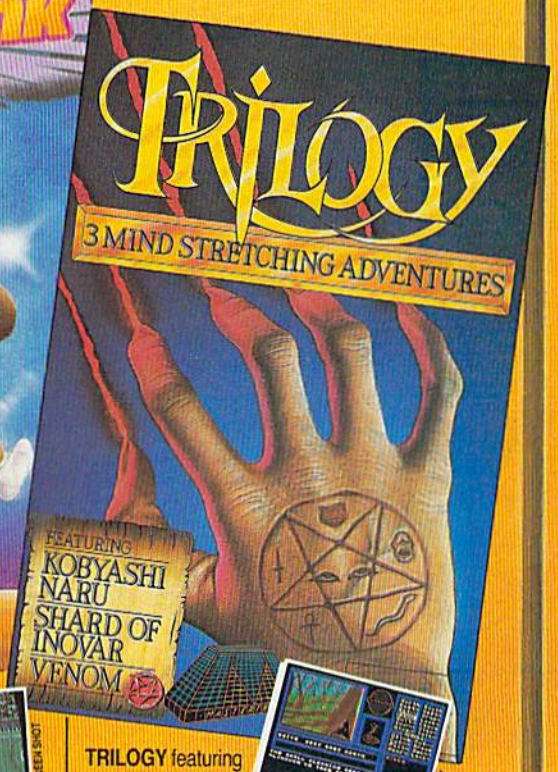
My native language is French, and I use a 64 with GEOS. The main use of my computer is for word processing, but GEOS lacks all the crazy French accents that we like to put here and there. Could you help me find a way to convert my system into a real French thing?

Daniel Girard
Quebec, Canada

You'll find just what the doctor ordered in this month's "GEOS Column."

The GOLD Collection





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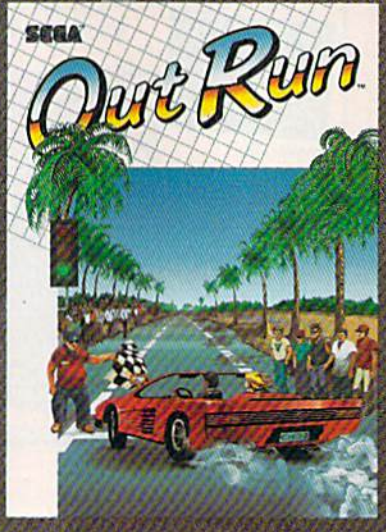

Hot car. Hot music. Hot scenery—beaches, cities, snowy mountains, deserts and the blonde next to you will tempt you to take your eyes off the road. At close to 300 KPH, our advice to you is a 4-letter word. DON'T.

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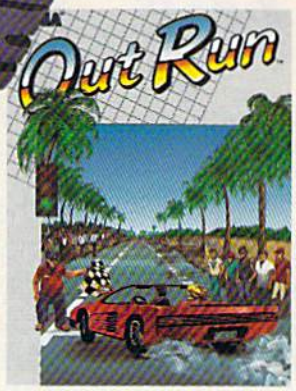

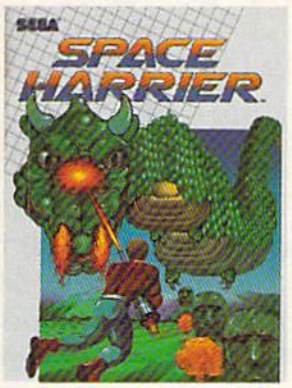

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NEW, IMPROVED, FASTER, FRIENDLIER

GEOS 2.0

A Major Upgrade

Robert Bixby

After two years of surprises, GEOS, the software package that turns the Commodore 64 into a convincing impersonation of a Macintosh, has reemerged vastly improved, faster, and friendlier than ever in version 2.0, the first major upgrade of this alternative Commodore operating system.

Anyone who has been using GEOS intensively over the last couple of years has probably assembled a lengthy wish list of needed features. Evidently Berkeley Softworks has been listening to our wishes. The latest GEOS upgrade has virtually everything users could want.

PROMISE FULFILLED

The original GEOS package contained the operating system, a handful of fonts, and a cheezy word processor that was murder to work with and whose principal attractions were its fonts, its WYSIWYG (What You See Is What You Get) display, and its ability to paste picture scraps into text files. It also contained a graphics package that was somewhat more impressive, but which often failed in the midst of a project.

What sold most people on GEOS wasn't its productivity, however, but its promise. *Unrealized potential*, my high school guidance counselor's favorite phrase, summed up the state of the early GEOS releases.

However, Commodore users are a forgiving group. GEOS promised them a new look in 64 software, a new flash and dazzle that would appeal to the users' creative side. Over a million of us felt the attraction of a graphics-based interface and responded, making GEOS one of the more successful ventures in home computer software.

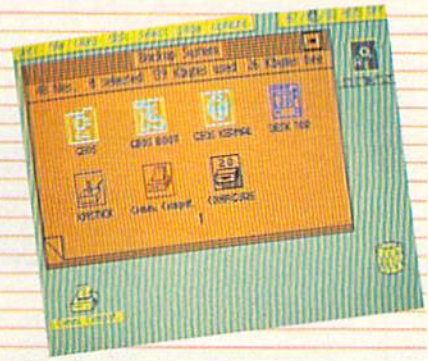
At last our patience has paid off. GEOS 2.0 fulfills that early promise. The basic GEOS 2.0 package, with word processor, spelling checker, and graphics package, is a real productivity machine.

Commodore will no longer bundle *geoWrite* and *geoPaint* as freebies with the 64C computer. Soon, only the upgraded operating system, deskTop 1.5, and some product demonstrations will be packaged with new Commodore disk drives. You'll have to purchase the productivity package (*geoWrite* 2.1, *geoPaint*, *geoSpell*, and their attendant utilities) as a separate package. Why bundle only the operating system when it's also available in the productivity package everyone has to buy separately? One must presume that the profit motive enters into the situation somewhere. But, after all, Berkeley is a company, like others, doing business.

The bad news: If you purchase a new Commodore disk drive, even with the 1.5 operating system bundled with it, you'll still have to buy a GEOS-compatible word processor and paint program to make use of the new GEOS. The good news is that they're worth every penny. More about them later. For now, let's concentrate on the centerpiece of GEOS, the program that oversees and coordinates all others: the deskTop.

The most instantly recognizable new features of the deskTop are a visible clock and two new menu choices on the command menu bar.

The new deskTop allows most menu items to be selected with a key-combination. This adds convenience and reduces the need for mouse and joystick manipulation.



The clock is an obvious improvement in the new deskTop.

deskTop 1.5

The first thing you'll notice about the deskTop version 1.5 is that there are more choices across the command menu bar. The new items on the menu are Select and Page.

Select allows you to select all of the items on a disk's directory at once, to select everything on the visible page, or to select all the files in the border area.

You can also select more than one item by holding down the Commodore key and clicking with the pointer on an item. By clicking again on the same icon with the Commodore key depressed, you deselect that item. This powerful addition allows you, for instance, to select a group of files and move them to a ramdisk *en masse*. That way you can take advantage of ramdisk speeds without having to supervise moving all the necessary files into RAM. You can either place all the necessary files on a disk or on a page of the notepad or select them with a mouse click and deposit them on the ramdisk icon. A minute or so later, your ramdisk is ready for action. This very closely approximates batch processing.

Selecting the Page pull-down menu, the other new addition to the command menu, allows you to add or remove notepad pages. Removing a page provides a very quick way to scratch up to eight files from the disk. Simply move your unused files to a single page and then delete the page. A dialog box will warn you that you'll lose the files when the page is deleted. Just click on OK, and they're history.

KEYBOARD COMMAND ENTRY

As you look at the menus on the deskTop, you'll recognize an additional improvement: You can select nearly any function from the keyboard via a key combination that uses the Commodore key. This enhancement for GEOS 2.0 reduces the need to provide both keyboard and mouse input. The View, GEOS, and Options menus, more rarely used, aren't provided with Commodore-key equivalents.

In addition to the improved keyboard selection of deskTop menu items, you can select icons from the keyboard and flip to pages beyond page 9 with the keyboard. As before, the number keys flip to pages 1–9, but now, by pressing the SHIFT key in combination with the 0–8 keys, you can move instantly to pages 10–18. Eighteen is the maximum number of pages in the deskTop notepad because 18 pages of 8 files each provides room for 144 files, the maximum allowed on a Commodore disk drive.

To select icons from the keyboard, press the Commodore key in combination with the number keys 1–8. The numbers 1–4 correspond to the top row of file icons and 5–8 correspond to the bottom row. To deselect a file, press the key combination again. Berkeley seems to have left nothing out when it comes to convenience.

THE CLOCK

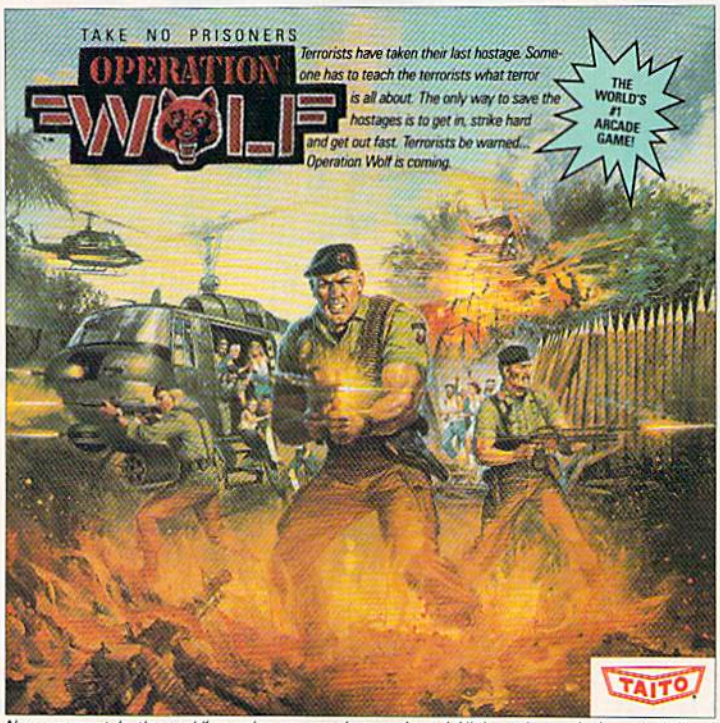
The second instantly apparent improvement in the deskTop is the clock at the top right of the screen. It's always visible and can be set simply by clicking on it and typing the current date and time. Unless you have a built-in clock, you'll have to set the GEOS clock at the beginning of each session. But having it visible serves as a reminder to set it, and an accurate time-stamp on your files can be very valuable.

COLOR deskTop

An interesting option is the ability to change the color of the deskTop icons and the notepad foreground and background. You can make the icon for each type of file a distinctive color of your own choosing, or

SEVEN WAYS TO MAKE YOUR COMMODORE SCREAM

1) EXPLOSIVE COMMANDO RAIDS.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Terrorists have taken their last hostage. Someone has to teach the terrorists what terror is all about. The only way to save the hostages is to get in, strike hard and get out fast. Terrorists be warned... Operation Wolf is coming.
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TAITO

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RASTAN
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TAITO

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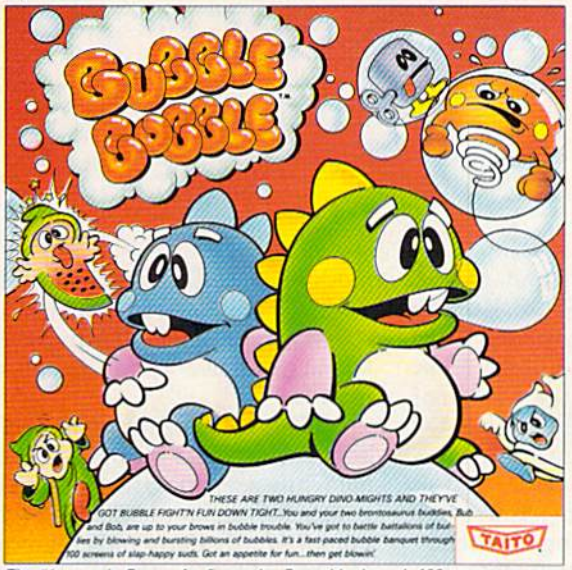
BUBBLE BOBBLE
THESE ARE TWO HUNGRY DINO-MIGHTS AND THEY'VE GOT BUBBLE FIGHT'N FUN DOWN TIGHT...You and your two brontosaurus buddies, Bub and Bob, are up to your brows in bubble trouble. You've got to battle battalions of bubbles by blowing and bursting billions of bubbles. It's a fast-paced bubble banquet through 100 screens of slap-happy suds. Got an appetite for fun...then get blowin'.
TAITO

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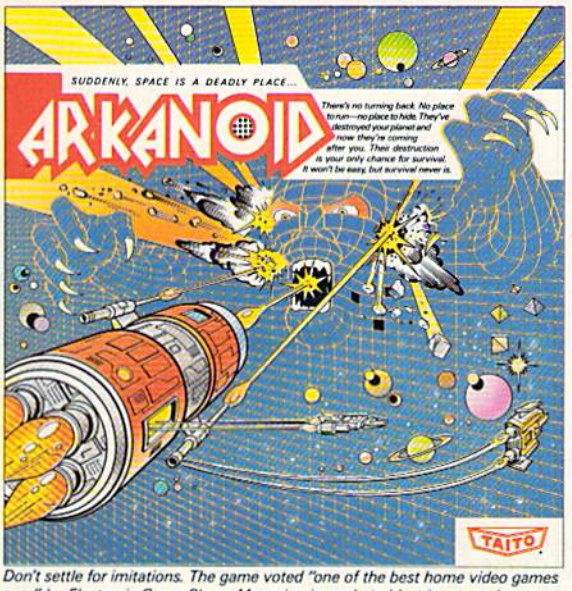
SUDDENLY, SPACE IS A DEADLY PLACE...
ARKANOID
There's no turning back. No place to run—no place to hide. They've destroyed your planet and now they're coming after you. Their destruction is your only chance for survival. It won't be easy, but survival never is.
TAITO

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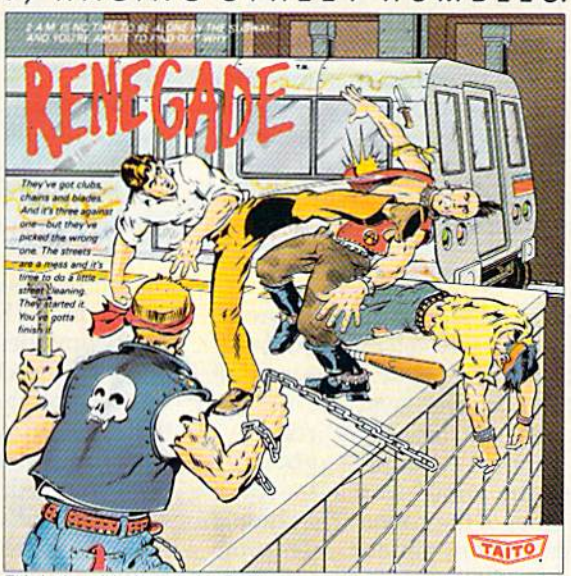
7) RAGING STREET RUMBLES.


RENEGADE
They've got clubs, chains and blades. And it's three against one—but they've picked the wrong one. The streets are a mess and it's time to do a little street cleaning. They started it. You've gotta finish it!
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you can use one of the three defaults provided. Plus, there's *Color Off*, an option that leaves the deskTop monochrome.

This is an interesting extension of the Preference Manager. Perhaps imaginative GEOS users will be able to make good use of this feature. It's an example of how far the Berkeley programmers will go to make GEOS as flexible as possible.

So far nothing has been done about the polka-dot background in the deskTop that causes weird, strobing vertical bands of blue and red proximity colors on some color monitors. It would be nice to have a Control Panel feature like the Mac's, in which you can adjust the mouse travel and the background pattern on the deskTop. Maybe in 3.0. . . .

TRASH AND PAINTER ICONS

The selected printer driver has to be on the currently selected disk in order to use the printer. If it isn't on the disk, the words *Not on disk* appear beneath the printer icon.

Berkeley has thoughtfully moved the printer icon to the lower left corner of the screen. That should prevent absent-minded users from dumping their printer files into the trash by mistake. For those who do it anyway, Berkeley has added another laudable improvement: A file thrown in the trash is retrievable.

When you throw a file in the trash, its name appears beneath the trash icon. If you click on the trash icon, the file will return to its former position on the deskTop. Bless them. They really do care.

This state of grace is temporary, however. The next time you access the disk, a file in the trash is gone permanently.

DISK DRIVES

GEOS now supports up to three mass-storage devices: one or two disk drives and one REU (RAM Expansion Unit). If you click on Configure, you will be given the opportunity to set up your drives as you want them. The standard 256 REU can emulate a 1541 disk drive. If you customize your REU by packing it with an additional 256K (or operate GEOS on the 64 side of a 128 with a 512K REU), the RAM expansion can emulate either a 1541 or a 1571 disk drive, and at the same time it can *shadow* the 1581 disk drive, causing its already fast action to accelerate further. But for sheer speed, nothing can beat a ramdisk. Ramdisks make long, frustrating pauses while loading applications and files things of the past. Once the file has been placed in RAM, it can be called to duty in a second or two. Even a massive application like *geoWrite* or *geoPaint* will load and be ready for action in a little over two seconds.

It should be mentioned that the three disk drive icons aren't quite equal. There's no C drive. You can't copy files to the third drive or open it by clicking on it. However, by dragging the third icon up to the first, you can switch drives from the deskTop. Whatever had formerly been your A drive becomes your inactive third drive. Although it might have been nice to have three active drives, the convenience of trading the third drive in and out is almost as good. It's certainly easier than rearranging your daisychain every time you change drives.

REBOOTING

One of the best things about GEOS 128 is its ability to recover from a crash without losing the contents of the ramdisk. Crashes are rare with GEOS 2.0, but when they happen, RBOOT is your lifeline. To effect a warm boot, insert the boot disk into the A drive and type LOAD "RBOOT",8,1. If your ramdisk is functioning, this should recover your operating system, and you'll be able to preserve those volatile ramdisk files. If you are running GEOS 2.0 on a 128 in 64 mode, you can reset by pressing the reset switch and holding down the Commodore key. If you have a 64 or 64C, you will have to purchase a reset switch or have a hardware wizard in your user group install one for you.

(The value of the reset and reboot feature was brought home to me while preparing this manuscript with *geoWrite* on the ramdisk when one of North Carolina's nightmare electric storms rolled out of the mountains. As lightning crashed all around my house, I thought it might be prudent to save my work. No sooner had the disk begun to spin than the lights went out. They were only out for a heartbeat, but the computer reset. The article was gone. I remembered that the RAM chips in the 128 and the REU are relatively persistent, so I tried RBOOT. Sure enough, the file—the only copy in existence—was still on the ramdisk, completely uncorrupted. It was the first time I'd heard of a ramdisk more reliable than a floppy.)

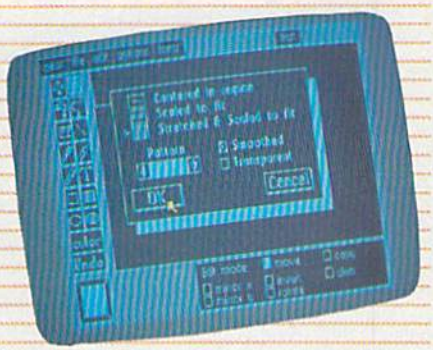
INPUT DRIVERS

I was disappointed to note that the touch-tablet input driver is still awkward to use. It will still move the pointer and pull down a menu, but once the menu is down, all action stops dead. You have to search on the pad for the pointer. Pulling the stylus downward and to the right usually picks up the pointer without too much difficulty on most menus, but selecting the font size is nearly impossible, and moving the *geoPaint* canvas with the move tool was beyond my abilities after several minutes of trying. It's a shame that this wasn't fixed, because there's nothing more natural to use in *geoPaint* than the Koala Pad. I am told that fixes for some of these deficiencies are available through shareware and on QuantumLink.

There are many more minor improvements to the GEOS 2.0 deskTop, but it's enough to say that as good as GEOS deskTops 1.0 through 1.4 are, 1.5 is a major improvement. It leaves little to be de-

geoWrite 2.1 provides a host of improvements over earlier versions, including search and replace, wider margins, and justification.

geoPaint is improved again with surprising cut-and-paste features, ovals, and a constraint option.



Pasted images can be centered in a paste box or scaled to fit. They can also be repositioned, resized, smoothed, or pasted transparently.

sired from the Commodore 64.

geoWrite 2.1

In order to put word processors into perspective, it helps to recall the price you would pay for a word processor for another machine and the prices the machines themselves fetch. A Macintosh SE can cost $3,500 or more. A high-quality word processor for this machine typically weighs in at 300K–600K and ranges upward from $200. For that price, you're provided with useful features like kerning and footnotes. By comparison, you can buy a Commodore 64 for under $200, even if you buy it from a camel dealer, and *geoWrite* 2.1—which doesn't provide for footnotes or kerning, but which does come with *geoPaint* and *geoSpell* at no extra charge—sells for around $60 ($25 if you're a registered GEOS owner) for a 35K program.

The striking difference isn't between *geoWrite* 2.1 and a high-end Macintosh word processor; in fact, they aren't very different and certainly aren't as different as the price might lead you to believe. The real difference is seen when *geoWrite* 2.1 is contrasted with *geoWrite* versions 1.0–1.3. When you compare them feature for feature, you must agree that *geoWrite* 2.1 is truly a second-generation word processor.

Early releases of *geoWrite* offered word-wrap; tabs; block delete, copy, and paste; page breaks; and a WYSIWYG display. All of these plus a formidable array of power features are offered by *geoWrite* 2.1. The 2.1 version supports margin, decimal tab, and paragraph indention for individual paragraphs. You can also center a paragraph, fully justify it (providing smooth margins on the right and left side), or justify it with smooth margins on either the right or the left.

It features decimal tabs, which allow you to line up a column of figures on the decimal point. You can insert headers and footers that extend up to a third of a page. The headers and footers can be time- and date-stamped, and the page number can be inserted.

geoWrite 2.1 contains a fully featured search-and-replace option, including settings for whole words or parts of words and for searching the current page or the whole text. The search is remarkably fast if you're using a RAM Expansion Unit.

There are many options that can be called from the keyboard for people who would rather not mouse around. All of the Style and Edit menus and most of the Page and Options menus are given keyboard equivalents. For instance, you can select the entire page with a single key combination. The cursor keys move the text cursor around the document page.

geoWrite also features line spacing, which can be set to single-, one-and-a-half-, or double-spacing. You can work with the entire page width, extending the margins to zero inches on the left and eight inches on the right. Operation is much faster and more reliable than earlier versions.

geoWrite 2.1 is an incremental improvement over *geoWrite* 2.0 available with *Writer's Workshop*. The most striking improvements are the decimal tabs and the eight-inch page width.

One problem that must be mentioned with regard to *geoWrite* 2.1 is the fact that in order to squeeze its optional eight-inch virtual screen into the 40-column Commodore 64 screen, *geoWrite* 2.1 has to make two transitions to get all the way across the page, while the six-inch page width requires only a single shift to accommodate its relatively restricted virtual screen. When you begin a new doc-

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ument with *geoWrite* 2.1, it will have a six-inch page width. Unless you really need the fuller page width, perhaps you should leave the default in force. If you prefer to work with a wider page, choose the full-page width selection from the Options menu to change the page format. Once the eight-inch page width has been selected in a document, it cannot be changed to a six-inch width.

During the transitions, as the virtual screen is shifted sideways to bring another region into view, the central processing unit is preoccupied with keeping track of memory and will often miss keypresses. There are two options: Type more slowly or write your first drafts with narrow enough margins to prevent shifting.

It should be noted that *geoWrite* 2.1 for the 128 doesn't need to make any transitions because the entire eight-inch page can be displayed at once on the 80-column screen.

geoSpell

An exciting adjunct to *geoWrite* is *geoSpell*, the spelling utility. It has been rewritten for the GEOS 2.0 package, and Berkeley claims that it's 38-percent faster than the *geoSpell* released several months ago as a separate package.

Its action is interesting. It scans the *geoWrite* text file until it finds 445 unique words. Then it compares them against a 96K dictionary. Words without matches are kept in a buffer. When it finishes with the unique words, the unmatched words are checked against your personal dictionary. The words that couldn't be found in either dictionary are then displayed in context. You have the option of correcting the spelling, skipping the word, or adding the word to your personal dictionary. It's one of the most flexible features of GEOS 2.0.

If there's any improvement to be made to this handy, friendly utility, it's that the buttons most likely to be used should be placed closer together as you work through the various levels of dialog boxes. There seemed to be far more repetitive mouse manipulation than necessary in this module. Also, they should remove the DO button, which carries out the correction, and replace it with a double click on the action selected.

geoPaint

The real star of the GEOS 2.0 show for the right-brained is *geoPaint*. It has always been the most fully realized and complete GEOS utility. Now it's even more powerful. In addition to its familiar features, the cut-and-paste option has taken one step closer to being a draw program. Paint programs essentially chisel the image into RAM. You can erase the image, copy it, or draw over it, but the image itself isn't flexible. It can't be adjusted. Draw programs, on the other hand, create an image out of mathematical formulas. Since the image is an abstraction, it can be manipulated at will.

geoPaint achieves this flexibility with an option to stretch and shrink pasted images to fit a predefined rectangle. When the image is pasted into place, it's equipped with MacDraw-like handles that can be used to reposition or adjust the size of the pasted picture scrap. The picture scrap pasted into the *geoPaint* file can be pasted transparently (that is, so that the graphic already on the screen shows through the white space in the scrap), and the black areas of the scrap can be pasted in any of the patterns available in *geoPaint*.

Another of *geoPaint*'s features has also been vastly improved: the airbrush. You can select whether the airbrush will spray a pattern in negative or positive—whether it will spray only the black areas of the selected pattern or only the white areas (erasing where the pattern is white)—or whether it will spray both (as in the original *geoPaint*).

The former circle feature now draws ovals. The ovals can be *constrained* to circles. Likewise, rectangles can be constrained to squares, and lines drawn with the straight-line icon selected can be constrained to multiples of 45 degrees from the horizontal. As yet, there's no polygon feature or Bezier curve, as can be found in many Macintosh programs, but I am sure someone in Berkeley is staying up late working on them.

MISCELLANEOUS FEATURES

There are large improvements in the familiar GEOS desk accessories. Photo scraps can be given names and searched for with a special search feature within the Photo Manager. This makes collections of clip art more manageable. The package also includes *geoLaser*, a utility that allows you to print your file to an Apple LaserWriter if you have a serial interface. You can print out masses of merged documents with *geoMerge*. Text Grabber imports text files from virtually all kinds of Commodore 64 word processors for editing, formatting, and printing with *geoWrite*. Finally there are the Paint Drivers that convert a *geoWrite* document into a *geoPaint* file, which can then be edited with *geoPaint*.

To long-time users of GEOS, the environment will seem strange yet familiar. Although all the well-known GEOS features are still there, it seems that around every corner some revolutionary improvement has been added to make the operating system and its applications many times more powerful.

Those who haven't yet turned to GEOS should examine this extraordinary package posthaste. It works beautifully with the basic arrangement of the Commodore 64 and 1541 disk drive, but its speed and power are dramatically enhanced by the 1581 and 1571 disk drives and the 256K or 512K RAM Expansion Units.

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COMPUTERS IN T

Tom Netsel
Assistant Features Editor

Have you ever had friends or relatives ask you what you use your computer for? Games and entertainment are popular responses, but many of you put your machines to work at home or in the office. We posted a message on QuantumLink and on more than 15 electronic bulletin boards from Maine to California, looking for interesting 64 and 128 home and small-business applications. Many of the boards were operated by Commodore user groups, and the system operators (sysops) went out of their busy ways to be helpful. The Greater Omaha Commodore Users Group—North BBS even posted an announcement that appeared when callers logged on, encouraging replies.

We've printed a sampling from the dozens of real-world applications you supplied. Since the applications are so varied, we felt each one deserved its own story and headline.

(A special thanks goes to the management, sysops, and supporters of QuantumLink. Their help was invaluable in putting this feature together.)

Radio Station Gets Signals From 64

PHOENIX, AZ—Call any of KTAR's listener-participation radio programs, and the show's host knows your name, your age, where you're calling from, and what's on your mind by the time he picks up the phone and puts you on the air. How does he do it? His 64 tells him.

When you call any of the station's news, sports, or talk shows, a producer, engineer, or other station employee answers the telephone before you go on the air. At KTAR, the employee answering the phones sits in front of a 64 that's connected to two 19-inch monitors, according to Ed Wilke, assistant director of engineering. One monitor is in the control room and the other is in the studio in front of the host.

Shows often have guest experts who field questions and comments from listeners, and the listeners often disagree with the experts, Wilke said. When a host is ready to take callers, he checks the monitor and sees something like this: *Caller number 1's name is Mary. She's on line 2. She lives in Sun City. She's 65 years old, and she thinks your guest is full of beans.*

Other information at the bottom of the monitor tells the host the time for the next commercial and whether he's to do a live spot for a local furniture store or play one that's recorded. The host keeps tab of who's on hold and when to break for a commercial, and the other employee screens calls and runs the tapes.

The operator also has the option of marking callers as calling from a mobile phone or a telephone booth so the host can get to them sooner.

The program, Talk Screen, was written originally for a VIC-20 in 1982 by then-employee Tim Greer. The program has been upgraded several times and now operates on a 64. It now also boasts a realtime clock and space for other comments.

Talk Screen and the 64 get a good workout at KTAR. Except for times the station carries a network program or a Cardinals game, the two are hard at work 24 hours a day.

128 Puts Finger on Bad Guys

OMAHA, NE—Fingerprints found at the scene of a crime can mean a major break for police, but they can be a major headache for crime-lab technicians who have to find a match among the two million prints in the city's files.

A computer can help with the sorting, but commercial fingerprint systems are expensive. "It's becoming common for states and large police divisions to use computers for fingerprint matching," according to Richard Ingraham, crime lab technician for the Omaha Police Division. "But that doesn't really help your medium or small locations that don't have $1 million to invest in a fingerprint system."

To help meet the challenge, Ingraham took a public domain database-management system and modified it on his 128 for fingerprint identification. The Battley fingerprint system is the core of the program. Ingraham first demonstrated it at the FBI Academy while attending a class there. The system permits fingerprint characteristics to be entered in data fields and then matched by the computer.

It's not practical to compare a set of prints against all two million in the city's system, Ingraham said. Witnesses can be a big help in reducing the number of possible suspects by providing a description of the criminal. Knowing a suspect's sex, approximate age, and weight helps eliminate some of the prints the program has to check.

In an effort to eliminate the paper search, Ingraham plans to upgrade Omaha's system by adding an Amiga with an optical reader that will display actual fingerprints on the monitor. This will give the Omaha police an effective tool to help fight crime, he said. "And it'll cost a heck of a lot less than $1 million."

HE REAL WORLD

Air Force Vets Swap Props for Profits

NICEVILLE, FL—After careers in the Air Force, two south Florida residents not ready for rocking chairs have put their 128s to work for them. Dick Kirk, who retired two years ago, spends time buying and selling mutual funds with a program he wrote for his 64, and William Schaal, an Air Force colonel approaching retirement, uses his 128 to write résumés and cover letters as he prepares for a new career.

Fidelity Mutual Funds offers its customers an electronic means for buying and selling its family of mutual funds. Its FAST (Fidelity Automated Service Telephone) system lets account holders buy and sell funds via a touch-tone telephone. By calling an 800 number and entering certain codes, they can get the current share price of a fund, the number of shares in their account, and the dividends paid. They can also place orders or arrange for transfers between funds. The service is fast and convenient, but Kirk and his 64 have improved on the system.

"I've taken a Hayes modem that generates touch tones and written a computer program that allows me to do all these transactions from my 64," Kirk said.

The Fidelity computer answers with a recorded voice and prompts customers to enter their fund codes, their account numbers, security codes, and transaction codes. Kirk's program stores all this information and transmits it at the touch of a function key.

The program has grown over the past two years until it's finely tailored to fit Kirk's investment needs. It keeps track of all his transactions and computes an average cost per share—a figure that helps him determine whether to stay in or get out of a particular fund.

It prints the net worth of his total investments and monitors his total capital gains or losses throughout the year. "At the end of the year, I print all this out, attach it to my Schedule D, and say, 'Thank you, IRS.' It's not exactly in IRS format," Kirk said, "but so far they haven't kicked about it."

While Kirk's program has automated his bookkeeping chores, it isn't smart enough to advise him about which funds to buy. "I have to tell it what to pick, unfortunately."

Across town, William Schaal, who has just retired from the Air Force, wants to put his master's degree in civil engineering to use.

"I went through the résumé route that's advertised in all the papers," he said. "I gave them all my material and took one look at their product and decided my Commodore could do the same thing."

Using Professional Software's *Fleet System 4* with his 128, Schaal prints custom résumés and cover letters on a Panasonic 1091. He's pleased with the results. "The quality comes out equal to what I used to pay for," he said.

Schaal bought his 128 to use primarily as a hobby, but he believes computer skills are fast becoming a requirement in the job market. "The last executive who has no computer knowledge has already been born and already has a job. When I told my wife that, she said go ahead and buy one."

As of this writing, Schaal has turned down one offer and has interviews scheduled with several major corporations.

Fireman Rekindles Fund With 128

TULARE COUNTY, CA—When funding problems stalled county officials' efforts to computerize the fire department, a Lemon Cove fireman decided his 128D could do the job.

"Several of us who have Commodore computers got together," said Tom Bales, fire engineer at Station 13 in Lemon Cove. "We're running our own individual stations with our own little program packages until the county can come up with something."

Officials in Tulare County, which is about 50 miles south of Fresno, had hoped computers could help eliminate some of the paperwork involved in running a fire department. They want to buy $4,500 Sperry systems for each of its 28 fire stations, but the county is having trouble finding the money.

"In an outfit like this, there are tons and tons of paperwork," said Bales. Fire incident reports, investigation reports, and emergency medical service reports must be kept on file for five years. Station inventory, fuel records for each vehicle, and training reports are some of the other records each station must complete and keep on file.

Some of the firefighters with 64s and 128s decided their computers could handle the work. Bales wrote several programs in BASIC on his 128D to generate most of the reports. "These are all custom programs, so individual stations can tailor them to fit their needs. The program is strictly BASIC," he said, "so even the people with IBMs can adapt them to their systems."

Bales said he "got stuck" with writing the programs last year. He stores the data in random-access files that can be printed whenever a hardcopy is needed. Bales claims he's not really a programmer, but

See "Fireman" page 22

COMPUTERS IN THE REAL WORLD

Farmers Spread Seed with Spreadsheet

UNION, IA—By using a 64 and a spreadsheet to record income and expenses, Dale Martin and his family keep an accurate eye on the financial health of their 1200-acre grain and livestock farm in this farming community of 500.

In addition to tracking their cash flow, each winter Martin and his two sons prepare an analysis for the coming year. An accurate analysis requires a complete listing of the approximately 25 different expenses required to produce a crop. These expenses, which include such items as rent, fertilizer, and herbicides, are entered into the spreadsheet. Each field has its own sheet, Martin said.

The Martins use an electronic device that measures the number of bushels of corn as it is harvested. This gives them an exact production figure for each field. This information also goes into the program.

Based on these calculations, the Martins take their projections for the coming year to the bank to arrange for next year's financing.

"We've always done something like this, but each year we had to start from scratch," said Martin's son, Jon, who set up the program on his 64, using Timeworks' *SwiftCalc*. "It took a little longer the first year to install it on the computer, but I anticipate this coming year it'll go rather quickly. Once you've got the format, it's just a matter of filling in the blanks."

"At the end of a season, it's easy to compare what we said we were going to do with what we actually did," Dale Martin said. "And that's what the banker really likes."

Desktop Publishing A Blessing To Church

ASHEVILLE, NC—Advertising is effective. It helps sell soap, and one minister finds it helpful for spreading the word around his church.

As minister of recreation at the First Baptist Church of Asheville, North Carolina, the Rev. Phillip Allen is responsible for the operation of the church's recreation center. It has a gymnasium, craft center, game room, racquetball court, and weight room. Allen oversees all the recreational activities for the church in addition to planning special activities, including sporting events, crafts, outdoor activities, and social gatherings.

Making the congregation aware of these activities has always been a problem, and getting the members to respond is another problem altogether. The usual Sunday-morning announcements are often forgotten, and small printed reminders are frequently overlooked.

Allen decided to use his 64 with Berkeley Softworks' *geoPublish* to prepare eye-catching announcements, bulletins, and handbills. He uploads his promotional material through QuantumLink's laser-printer service to get a quality master copy and then makes copies of that for distribution.

"It's been very effective. It's something a little out of the ordinary, and it's even spurred some interest in computers. I'm beginning to develop an interest group in computers just because people have seen some of my fliers and handbills and they've said something about them."

Allen posted handbills around the church announcing a white-water rafting trip one weekend, and another series reminded the congregation of a children's pet fair and a hot dog cookout.

Fireman *continued from page 21*

he manages to keep up with the county's demands. "It seems like every time we get one done, somebody comes up with a new form," he said.

Bales has no idea when the expensive equipment will arrive—if ever. Until then, his 128D is staying on the job. "It's nothing fancy, but it works," he said.

VIC Wins $$$

OMAHA, NE—Winning a lottery takes luck in most cases, but Monica Sudds credits her computer for helping her win.

A local radio station sponsored the contest, and tickets were available from local merchants. The more numbers announced that matched the numbers on the winner's lottery cards, the bigger the prize.

"With the help of my teenagers," Sudds said, "I gathered about 500 tickets." The radio station read a list of numbers, and winners had to call within 30 seconds to claim a prize. "I couldn't keep track." She turned to her VIC-20 for help.

Sudds wrote a small program to load numbers into an array. As the station called the winning numbers, Sudds entered them into her program for comparison. The VIC-20 checked the numbers in a flash.

As the contest progressed and Sudds entered more numbers, her VIC ran out of memory. A memory-expansion board solved that problem, and a few days later Sudds hit the jackpot.

"I did it with my old VIC-20 and ended up winning $2,600 in cash and prizes," said Sudds. "It more than paid for the $59 memory expander." *continued on page 26.*

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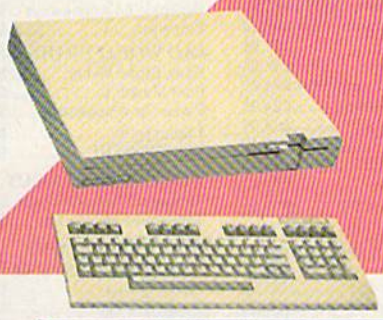

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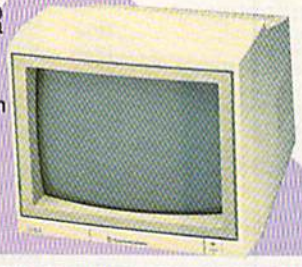

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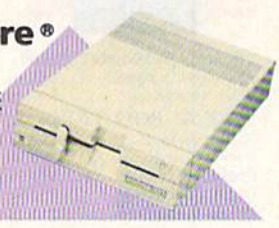

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COMPUTERS IN THE REAL WORLD

Musician's 64: No Mickey Mouse

ORLANDO, FL—A Walt Disney World musician and entertainer finds his SX-64 is an ideal computer for making music with a pair of digital synthesizers.

John Charles, who sings and plays guitar and piano at the Magic Kingdom's Grand Floridian Beach Resort Hotel, has entertained vacationers for 16 years at the entertainment complex in central Florida.

Charles uses an SX-64 as a MIDI sequencer and librarian, controlling his Korg M1 and Casio 5000 synthesizers. A 16-sequence, eight-channel sequencing and recording studio program from Music Digital provides Charles with a wide range of musical tools to use in expressing his creativity.

"It allows me to work musical phrases very similar to the way you'd use a word processor with words," he said. "I can write a musical sequence, manipulate it, and then play back several sequences into a song. I can layer one sequence on top of another, and I can merge sequences together. All the things you can imagine. I call it a word processor for my music."

Most of Charles's MIDI applications are used for demo tapes and for composing at home. His act at the hotel is too spontaneous to make use of the sequencer. Kicked power cords and voltage fluctuations are another reason the SX-64 usually stays home. "Once you've MIDI'd a synthesizer, two drum machines, and your computer all together, you're all set to go," said Charles. "Then along comes a little power surge and everything defaults back to zip."

The SX-64 is popular with professional musicians because it's small and compact, Charles said. With its five-inch built-in screen, the SX-64 fits right on a musician's synthesizer rack, yet its memory is large enough to handle a professional's requirements.

Gymnastics Instructors Doing Flips over 64

HOT SPRINGS, AR—It's hard to keep your feet on the ground when you're working with 400 young gymnasts, but an Arkansas couple finds that a 64 helps keep their gymnastics school on its feet.

Becky and Doug Garner own and operate Hot Springs Gymnastics. When Becky's mother, Julie Cathcart, bought a 64, Becky asked her to handle the billings.

"I didn't know anything about computers," Cathcart said, "but I got Commodore's *The Manager*. It's out-of-date now, but I customized the screens and it works."

The 64's memory is too small to hold a year's worth of the gymnastics school's billings—400 transactions each month—even with a 1764 RAM expander. So Cathcart keeps about four months' worth of information on each disk. Each screen contains a month's billing information for one student. In addition to regular fees, a student may have additional items, such as uniform and travel expenses. *The Manager*'s built-in math function totals fees and subtracts them from any balance in the student's account. The difference is the amount owed.

Cathcart buys preprinted tractor-feed statements, and *The Manager*'s report function prints the student's name, address, and billing information on each form.

"Becky does her work at the center," said Cathcart, "and I do this at home. I also print out an alphabetical list of how much the kids owe with blanks for her to fill in as she receives checks. She brings this list back at the end of each month and I update the billings. It works great for us."

If This Is Tuesday, It Must Be Wife Number 4

RIYADH, SAUDI ARABIA—While Westerners use computers to track sales, inventory, schedules, and the like, those in other cultures find rather unusual ways to use their computers. At least one man in the Arabian capital uses his 64 to keep track of his wives.

Saleh has four wives—which is permissible under Moslem law—each in a different house. His biggest problem, if you discount four mothers-in-law, is remembering which wife he's supposed to be with and for how long. To solve this problem, Saleh wrote a program to manage his connubial schedule, according to a story that allegedly appeared in a Saudi newspaper.

Saleh has four wives because he wants lots of children, according to an unconfirmed report. While the law doesn't object to multiple wives, Saleh's family refused to talk to him after he married wife number 2.

Saleh walked down the aisle with wife number 3 when he learned from doctors that wives 1 and 2 could have only four children each.

Less than two months after that wedding, Saleh met another woman, and a week later her name was added to the program as wife number 4.

The 64 apparently keeps things running smoothly in the Saleh households, according to the Saudi newspaper, but it'll probably need a memory-expansion unit if he wants to keep track of all his children's birthdays.

If you have an interesting home or small-business application for your 64 or 128, we'd like to hear about it. Write to Tom Netsel, COMPUTE!'s Gazette, 324 West Wendover Avenue, Suite 200, Greensboro, North Carolina 27408.

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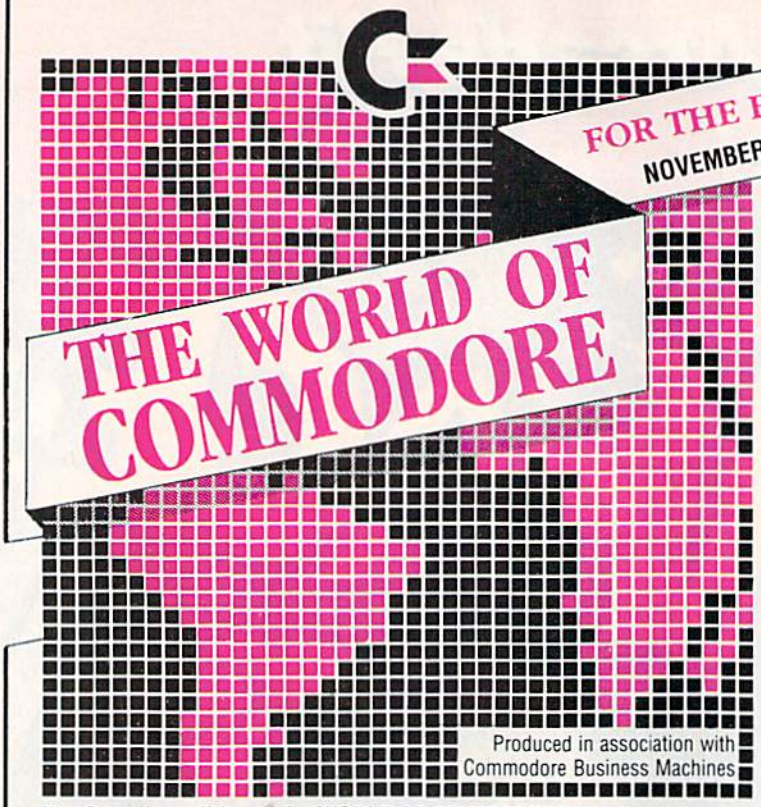

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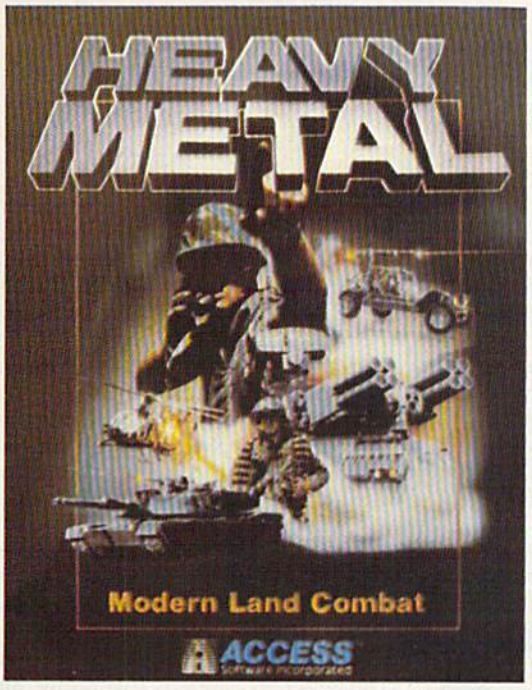

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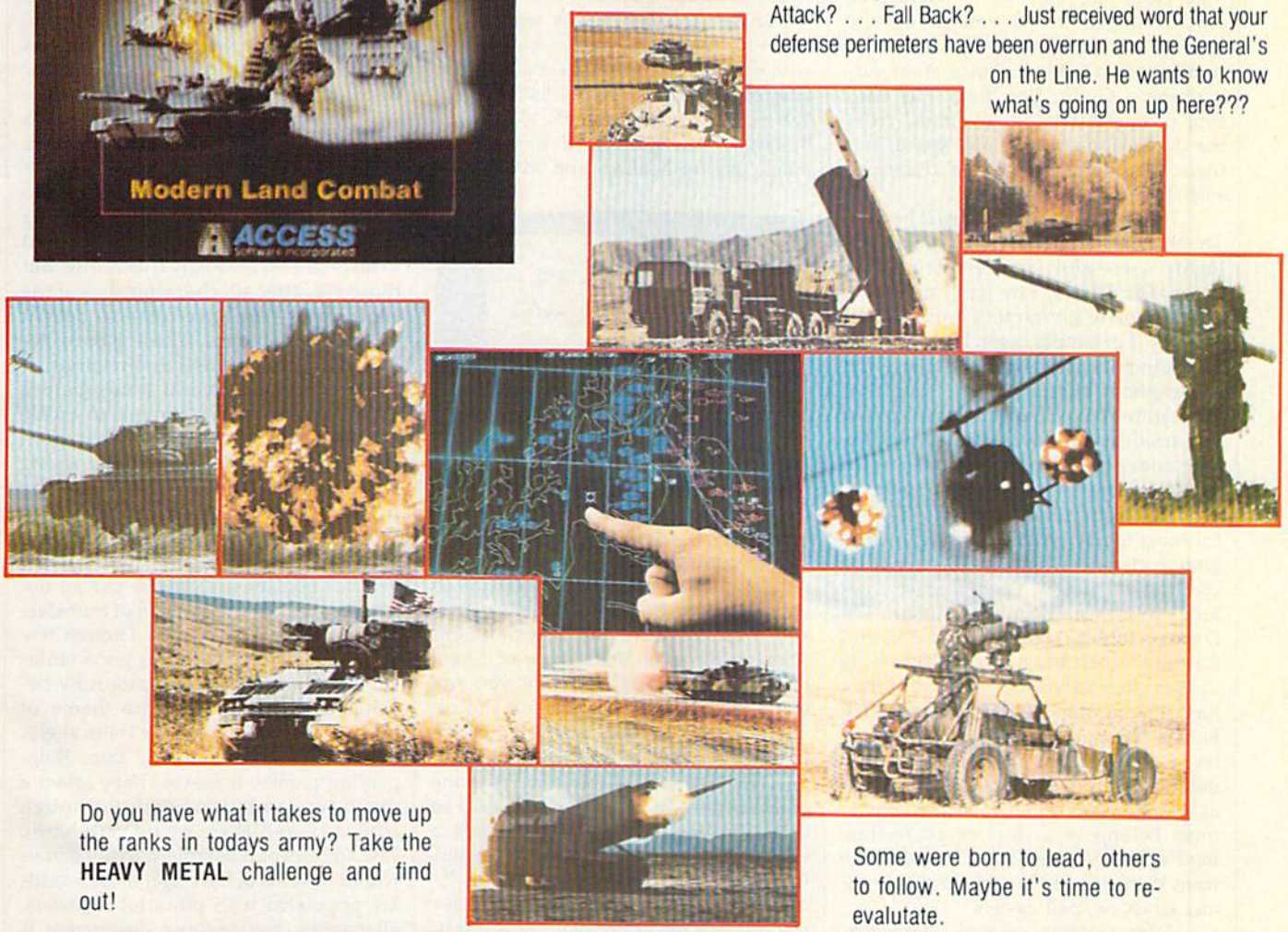

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Bard's Tale III: The Thief of Fate

All right. So far you've liberated Skara Brae, and you've saved the Six Cities of the Plains from great evil. But now, just as you've begun to understand the meaning of your victory, Tarjan, the Mad God, has returned to Skara Brae and destroyed it. As you sit on the ground, warming your hands in the small fire that lights the ruins of the Adventurer's Guild, you hear the Bard sing of one last hope. You must cross the dimensions of time and space, and then you might just have a chance to stop Tarjan.

That's where *Bard's Tale III* begins. The third installment in Electronic Arts' highly successful fantasy role-playing series, *The Thief of Fate* lets you import your favorite characters from *Bard's Tale I* or *II* or simply begin from scratch. The principle of this game is the same as the others, but the plot and several of the features have changed considerably. The result is yet another must-buy for the fantasy gamer, a gem in a field that has had more than its share of gems.

The inspiration for Bard's Tale, as for most fantasy role-playing games, is Dungeons and Dragons. You begin by creating characters. Each character belongs to a race, including Human, Elf, Dwarf, Hobbit, Half-elf, Half-orc, and Gnome, with each race having its unique characteristics. Each character has five numerically expressed attributes—Strength, Intelligence, Dexterity, Constitution, and Luck—which determine his or her chances of success at specific tasks. Finally, each character must belong to a class or profession; *Bard's Tale III* has 13. Classes range from Warrior and Paladin through various kinds of spell-casters.

After creating several characters, you form them into a Party. The Party then leaves the Adventurer's Camp and moves out into the surrounding area. In *Bard's Tale I*, the surrounding area was the city of Skara Brae; in *BT III*, it's the wilderness outside the ruined Skara Brae. As you move from place to place, the top left corner of the screen shows a picture of what you're looking at. If you're facing west, for example, and a street lies to the west, the view window will display a perspective view of the street.

As you move along and enter buildings and dungeons, you meet a variety of creatures. A few are friendly and will help the Party for a limited time. Most, though, are trying to kill you, and these you must kill if you wish to survive. You fight either with weapons, with spells, or, in the case of a Bard, with songs. When you defeat a monster, you receive experience points and gold. You need experience points to advance in levels; you need gold to purchase items, pay for healing, and so on.

Rainbow Dragon breathes at the party...
Redbeard repelled the attack!
Rainbow Dragon
Character
AC Hits Cond SpPt
1 Ironpants -21 659 659 31
2 Icebolt -24 441 441 9
3 Backstabber -24 441 441 9
4 T'Cid -8 441 441 9
5 Corwin -4 441 441 169
6 Gorm -12 441 441 389
7 Redbeard -9 471 471 371

The purpose of all this is to complete a quest. In *BT III*, the quest is to defeat the Mad God Tarjan. To do so, you must travel to the seven dimensions to discover the source of Skara Brae's destruction. Eventually, you will battle the Evil One; if you defeat this ultimate monster, you will save Skara Brae. Otherwise, all life will be lost.

For experienced role-players, none of this is new. In fact, the idea is now so commonplace that *BT III* includes a utility that lets you transfer characters from *Bard's Tale I* or *II*, *Ultima III* or *IV*, or *Wizardry I*, *II*, or *III*. It seems fantasy role-players never tire of endless questing after evil, so the designers of *BT III* have tried to make things more interesting, more challenging, and more involved.

They've succeeded. The game boasts over 500 monster types, most of which you will have to fight. There are seven varieties of spell-caster, including Geomancer, whose power comes from the earth itself, and Chronomancer, who enables the party to move among the dimensions. A total of 84 dungeon levels, some extraordinarily tough, stand between you and victory, and you'll have to visit all seven dimensions on your way to defeating the Evil One. To help you play the game more easily, *BT III* lets you save the game in places other than the Adventurer's Guild (a *big* help), and dungeon movement is automatically mapped for you. Finally, some of the weaker character classes have been enhanced to make them now worth taking with you.

Despite the new features, this is still the familiar Bard's Tale system. Monsters still appear with often annoying frequency. Keeping straight who has what item remains a mind-boggling business. And simply figuring out what to do is still occasionally frustrating. But those are, after all, characteristics of the genre, ones that have come to delight role-playing addicts. These games demand an enormous commitment of time: It's often several hours before your Party is strong enough to tackle anything other than the lowliest monsters. There's nothing inherently wrong with this, but new gamers may be frightened off quite easily.

Then, too, you could object to the whole premise. While the quest against evil has become an integral part of the fantasy market, the concept of monster-bashing is just plain silly. Though few and far between these days, good fantasy novels attempt to integrate fully developed characters and the theme of humanity's battle with the natural elements into a true mythic tale. Role-playing games, however, have taken a much less ambitious path (although *Ultima IV* and *V* are trying very hard). The authors of most role-playing games would have us believe that these worlds are populated with powerful monsters, all bearing gold, whose destruction is not only valid, but necessary.

Enough diatribe. For those who enjoyed *Bard's Tale I* and *II*—and I was certainly one of them—*Bard's Tale III* has enough enhancements and a strong enough plot to offer hours of thoroughly enjoyable gaming. This is a first-rate work, putting the Bard's Tale series at the forefront of the computer role-playing genre. As long as the Bard's Tale series competes for honors with SSI's Phantasie series and Origin's Ultima se-

ries (and occasional upstarts like *Faery Tale Adventure*), the fantasy gamer has a lot to be thankful for.

—*Neil Randall*

Bard's Tale III: The Thief of Fate
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4 × 4 Off-Road Racing

Holding the pedal to the metal is risky business in Epyx's *4 × 4 Off-Road Racing*. It's almost impossible to avoid rocks, logs, and other obstacles waiting to slash your tires or rip open your radiator, but you can't win races driving cautiously. So I kept the speedometer pegged as I raced south on the Baja Challenge. I had a tough truck under me—it was customized to my specifications—and I could smell victory.

So far I had avoided serious damage. I had the right spare parts to make repairs, and I'd studied the map and memorized the shortest route to the finish line. Things were looking good as I moved into seventh place. I'd passed ten other rigs and was about to leave another in my dust when disaster struck.

You have brakes, but forget them—this is a race. And it's one that gets your adrenaline flowing.

Just a moment ago, the speedometer needle showed 80 mph, but now it was the only thing moving fast as it raced toward 0. My 4 × 4 crawled to a halt as the Mexican desert disappeared and a damage report filled the screen. Damage was light: The radiator had a slight leak, but that shouldn't sideline me. Uh-oh! There it was: *Gallons of fuel on board: 0. Gallons of fuel in tanks: 0. The race is over for you.* Out of gas just short of the finish!

Racing with a heavy foot won't guarantee victory in this fast-paced but grueling off-road racing simulation. It's fun, but it'll probably leave you exhausted, especially if you do your best to avoid the rocks and debris. A heavy foot can also exhaust your fuel supplies. Use too much gasoline too fast and you'll become a spectator at the side of the road.

Come to think of it, *road* is too polite a term for the four courses the Epyx designers have prepared. If the Baja Challenge leaves you thirsting for more desert madness, take on the treacherous terrain waiting in Death Valley. If mudbogging is your sport, try sloshing through the slimiest red clay Georgia has to offer, or head for Michigan if you want to test your rig and driving skills on ice and snow.

Once you've decided on a course, it's time to select a truck with four-wheel drive that will get you to the finish in front of the competition. You have a choice of two powerful American vehicles, a sporty Japanese model, and a tough British import. Each is rated on seven factors, including power, gas mileage, endurance, and weight. Remember, a heavy truck burns more fuel, but it takes more punishment. And there's plenty of that down the road.

After selecting a basic truck, head for the Custom Shop for such personal touches as a winch, an extra-capacity fuel tank, and special tires.

Then stop by the Auto Mart to stock up on tools, spare parts, extra fuel, maps, and flashlights. You're working on a budget, so watch your cash and don't overload your rig. Be prepared, but don't try to take the whole store with you.

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Graphics in the opening sections—as well as the whole game—are great. You move a man into each store and press the joystick's fire button to select the items you want. Remaining cash, total weight, and volume are calculated for you. Careful strategy and planning at this point play an important part in the outcome of the race.

On the starting line, you have a driver's-eye view of the course. Your rig's dashboard contains a clock, speedometer, tachometer, and icons revealing the status of ten engine parts. When you're ready, steer with the joystick and accelerate by pressing the fire button. You have brakes, too—but forget them, this is a race.

A couple of seconds after the start, you'll probably clip a rock and flip end over end. But these 4 x 4s are tough, and unless you wrap around a saguaro cactus, you'll land on your wheels, still racing. Big rocks eventually damage even the toughest trucks, so avoid hitting them. Discarded tires or old logs don't cause much of a problem, but you'll go flying when you hit one. Show some respect, however, for the skeletons that appear to be hitch-hiking. They're probably old drivers, and they're hard on your truck's undercarriage.

Don't bash the snowmen when you're racing in Michigan—they're solid ice. Hit one and it will total your rig. If you do crash, you have two more chances to make it to the finish on each of the courses. (I particularly like the crash that wipes out the truck and driver but spares the dog.)

The manual clearly explains such features as checkpoints, how to make repairs, and how to get out of soft sand or mud. It also includes driving tips and a warning about the dreaded Doombuggy.

On the negative side, I have a problem stealing time to glance at the dashboard. Obstacles come so quickly that it's almost impossible to take your eyes off the road. Position reports and other information flash on the dashboard, but if you take the time to read them, you'll hit something.

Another problem is the length of the courses. The map doesn't reveal how long they are. I know a rig's gas mileage, but without knowing how many miles I have to go, it's difficult to know how much fuel to buy.

One final gripe—and it's a minor one—concerns the finish line. I usually fly past the little guy waving the checkered flag, and the race is over before I know it. It's anticlimactic.

Your adrenaline really gets flowing with *4 × 4 Off-Road Racing*. A typical race takes 25–30 minutes of intense concentration. After putting in all that work, I'd at least like to see a finish-line banner across the road and maybe a few people cheering. I think it would provide a more satisfying conclusion.

I've added my name to the Hall of Fame after finishing a couple of good races, but I'm still trying for King of the Road. I've got a feeling I can do better next time.

I got an idea after that last race. I can lighten the truck by leaving the winch. Then, if I take extra fuel. . . .

—Tom Netsel

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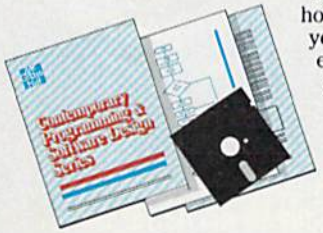

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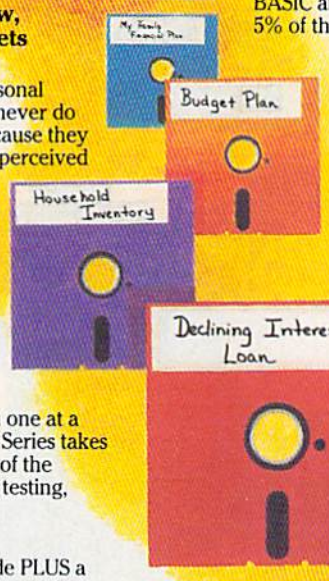

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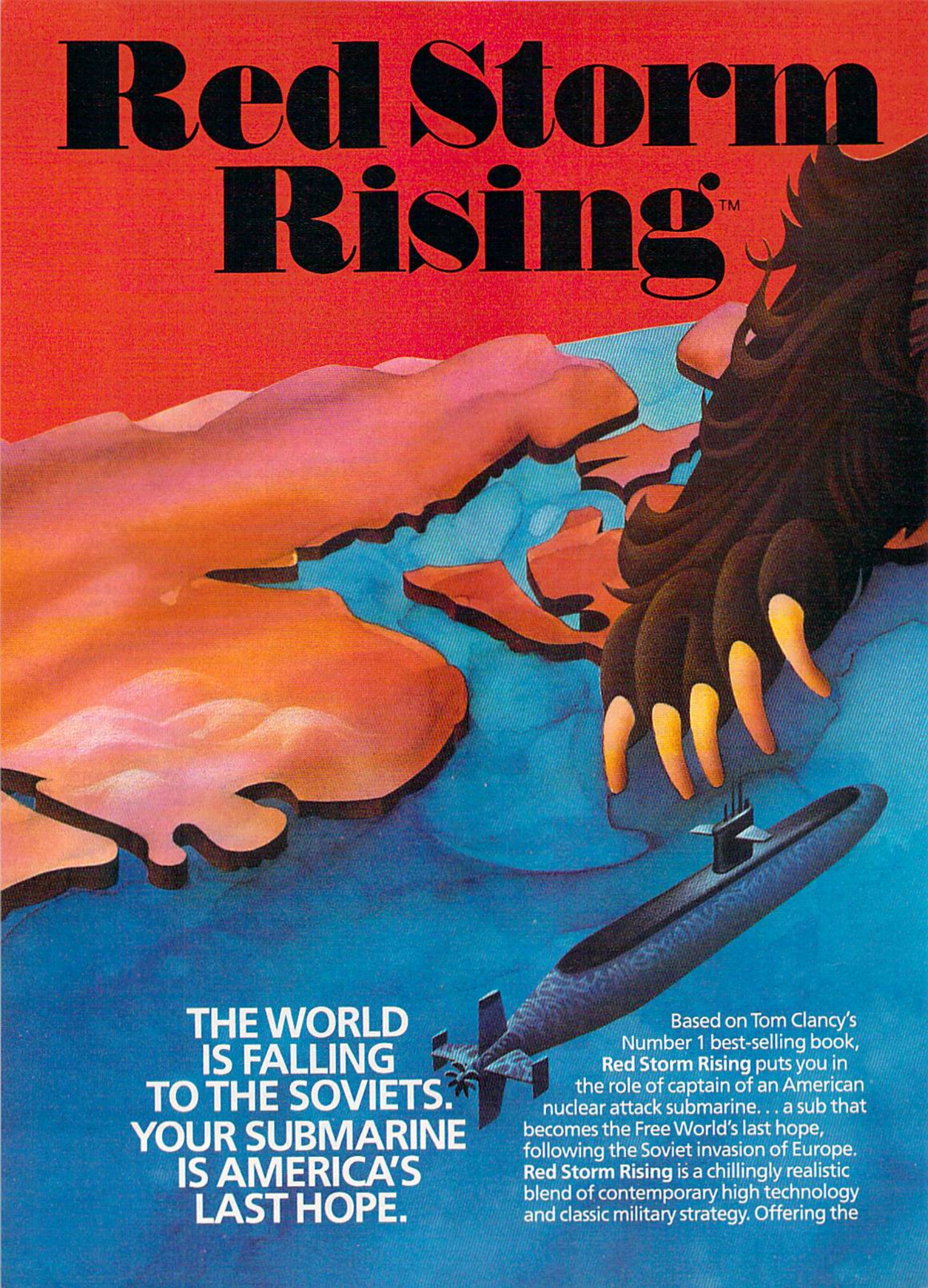

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Crossbow and *Karnov*

Close your eyes and imagine the smell of popcorn wafting its way through crowded aisles. Walking beneath the flashing lights, you listen to the noise and confusion of a hundred electronic tunes, each played at its own tempo, accented by the rapid-fire staccato of laser strikes and machine-gun bursts.

Welcome to the arcade, the exciting realm of flight and fantasy. Here, a roll of quarters is a perishable commodity. Those little round images of George Washington disappear in the blink of an eye, in exchange for electronic action and role-playing.

Many software companies have taken the challenge of duplicating this atmosphere, and some have even succeeded with a sophistication that rivals the mega-memory arcade games. Two recent releases for the 64—*Crossbow*, from Absolute Entertainment, and *Karnov*, from Data East—attempt to bring the excitement of the arcade to the comfort of your home.

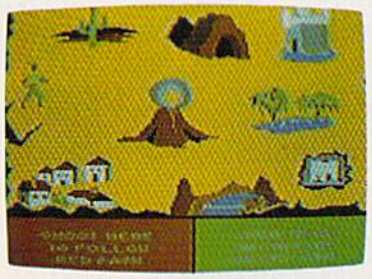
***The excitement of the arcade is brought to the home with* Crossbow *and* Karnov.**

In *Crossbow*, you're a sharpshooting archer, protecting the members of your troop as you travel over eight deadly levels of terrain. Your slow-walking friends start on the left side of the screen and leisurely cross to the safety of the opposite side, oblivious to the danger of falling boulders, rattlesnakes, huge birds of prey, and the indigenous villains that populate each domain.

Your task is to ambush these hazards before they put an end to your company. Your presence is represented by a tiny crosshairs pointer that moves as you take aim. Your favorite joystick replaces the clumsy rifle-style crossbow used on the arcade machine, a change I personally prefer.

Your journey takes you to a not-so-friendly town, a desert, an ice cave, and an erupting volcano, as well as to other uninviting territories. At each level of the trek, you can choose from up to three colored paths. An onscreen map displays the eight locales but offers no hints on how to reach your ultimate destination, deep inside the castle. One wrong turn can send you back to revisit a previously explored level, where the action accelerates and becomes even more deadly.

Crossbow is a fast-paced and enjoyable game, filled with rapid action and clear graphics. For the most part, it's faithful to its popular arcade twin. The documentation is little more than loading instructions, though this type of shoot-the-bad-guys game doesn't need a lot of explanation.



Crossbow

The opening graphics and introduction are impressive, with movie-style rolling credits that fade in and out. I had to laugh when I discovered that the initials and high scores on the Hall of Fame screen are none other than those of the game's designers: Steve, Dan, and Gary Kitchens; Robert Prescott; and Alex DeMeo; all with Design Imagineering. You'll have to score above 500,000 to bump these guys off the board.

Count your quarters—it's time to move on to the next machine. *Karnov* is based on a fire-breathing Russian of the same name. A bolt of lighting and a mighty clap of thunder announce the arrival of this latest arcade hero. When the flash and reverberation have faded, there stands *Karnov*, a one-time circus strong man who possesses the unique ability to shoot fireballs.

A huge and evil dragon called Ryu has made off with the Treasure of Babylon, hidden for centuries in the tiny and peaceful village of Creamina. The dragon has left in its wake hordes of evil minions to terrorize the countryside. Your mission is to dispatch these monsters and return the treasure to your people.

You must advance through nine levels of multiscreen action, avoiding death from numerous demons and dangerous obstacles while collecting *options* that can help you in your quest. These options are instruments found along your path that you stockpile for later use. Ladders, jumping boots, swimming masks, and wings are among the options needed if you are to fight the forces of evil on the land, under the sea, and in the air.

Like the arcade game, *Karnov* is extremely challenging. I consider myself a

pretty good gamer, but the ones I can't beat I turn over to the family expert, my eight-year-old son. *Karnov* exhausted both of us. One reason the game is so difficult is that, while the villains move at a reasonable rate of speed, Karnov is slow and clumsy. Only when you collect Super Fireballs, which make Karnov shoot two and three times the normal rate, does he become a formidable force.

Karnov

The arcade version has this same reputation for difficulty, which is not all bad. Challenging games guarantee months of thrilling play and offer a greater sense of accomplishment when you finally succeed. *Karnov* is an enjoyable game that will properly frustrate you, as any fine arcade-style game should. The obvious advantage of the Commodore game is the small fortune you save in quarters.

Data East has done a good job of translating the graphics and sound from the original big-brother version. The graphics-scene speed is slow and tends to flicker at times, though it isn't distracting. The documentation covers the IBM version in detail but virtually ignores the Commodore. I had to hit every key on the keyboard to discover that the Y key activates the *Use Option* command. This favoritism didn't hurt my feelings, for I realize that owners of other machines probably need a little extra help when it comes to gaming.

Arcades are fun places, but with the advanced programming techniques that let home computers emulate large coin-operated machines, game rooms may be symbols of the end of an era. All that's needed now is for someone to invent a small box that sends out beams of flashing lights, sounds of pandemonium, and the odor of burnt popcorn.

—Steve Hedrick

Crossbow
Distributed by
Mediagenic
3885 Bohannon Dr.
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$34.95

Karnov
Data East
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Master Ninja: Shadow Warrior of Death

If you've ever watched a badly dubbed, low-budget Kung Fu movie, the theme of *Master Ninja: Shadow Warrior of Death* should be familiar. Someone or something (in this case, a magic sword) has to be saved from an evil warlord. As an expert in the martial arts, you must perform the rescue while battling hordes of guards who are firing arrows and darts, swinging sabers and staves, throwing knives and shuriken—all aimed at you.

OK, so much for originality. But no matter how overused or unrealistic its plot may be, everyone loves a good, fast-paced action movie once in a while; the same goes for computer games. The designers of *Master Ninja*, a one-player martial arts game, have included some unique and interesting elements.

Many video games in this genre have a common defect: I always lose. Call me forgetful, but I simply cannot remember which permutation of joystick jiggling and fire-button jamming will result in the execution of a kick, punch, or jump. Nor can I recall precisely what the difference is between a spinning back kick and a kicking back spin. While I frantically consult the 20-page manual, the other player calmly pounds my poor video alter ego into a pulp. *Master Ninja* allows the player to execute 21 assorted attacks, defenses, and jumps, as well as use three weapons; yet it mercifully manages to keep the controls simple and easy to memorize.

In spite of this, I had a bit of trouble learning how to play the game because of its terrible manual. It gave me instructions for loading the game that were incorrect, a guide to joystick control that was inaccurate, and a lot of background on the game that I didn't need. Fortunately, the game gives beginning players a practice session and

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an onscreen guide to correct joystick functions.

One of the major problems with *Master Ninja* is that whenever your character dies, your character is really dead. Instead of having a few additional lives to spare, you are given a limited number of strength points. These are gradually bludgeoned away by repeated encounters with guards.

"What's this?" you cry. "Realism intruding into an action game?" Well, not really. But it is frustrating when your character dies, because it forces you to start again at the beginning of the game. Since there's no way to save a game, you either finish it in one sitting or you fail. This can be exasperating.

Despite my objections, I can say the designers of *Master Ninja* have managed to keep the game exciting by offering a variety of thoughtful considerations. In the manual, a map of the warlord's fortress shows clearly the location of your goal. Using the map, you can see that the fortress is divided into 26 separate rooms, two of which are outdoors. This permits you to choose different paths to your goal. Some paths are shorter but more dangerous; others are longer but safer. Instead of forcing a frustrated player to repeat the same mistakes each time, the game allows a player who cannot get past a certain point, or even someone who has reached the goal and won the game, to go back and try a different path. This helps keep the game fresh and surprising, even for an experienced player.

Though not dazzling, **Master Ninja** *manages to stay fresh and surprising, even for experienced players.*

Magic is used in a similar way. Curses and hexes stalk certain rooms in the fortress, and it is impossible to counter them. They can be avoided, however, and that's half of the game's challenge. At one point, for instance, I faced a choice between two routes; one led through three rooms and at least one rather nasty guard, while the other led through only one unknown room, the Mystical Garden. The choice seemed easy, but the moment I stepped into the Garden, an evil priest in red robes emerged and cast a spell on me. I was held powerless against his curse, even though he withdrew after a moment. The next time I checked my strength, I discovered the spell had sapped all of it. I died a short time later.

Overall, I would say the game's designers have tried to combine a rough-and-tumble adventure game with a game of strategy and tactics, and they've done a fairly good job with it. The program's worst problem is its slow speed. The rooms load too slowly from disk, wasting the game's excitement and the player's adrenaline.

Master Ninja's graphics and sound effects won't dazzle you, and the game's story line will not thrill you. But its flexibility and the size and complexity of the fortress will keep you guessing, something many other games fail to do.

—Jesse Cohn

Mater Ninja: Shadow Warrior of Death
Paragon Software
6OO Rugh St.
Greensburg, PA 156O1
$29.95

Mainframe

Once again, it's up to you and your computer to save the world—this time from a computer considerably larger than your 64, the Tricomplex III.

The Tricomplex III has just completed the final link in its effort to tie together the world's computers. In a secured complex below the Pacific Ocean, this massive computer has begun to think on its own and has determined that the only bug in its system is its human operators. Since it controls the military and has access to every record in the world, it's no small matter that the Tricomplex III has decided to debug itself.

In *Mainframe*, from MicroIllusions, you are the lone operative on an experimental space station, the Orbiter. While Tricomplex III controls the Earth, it does not yet control the Orbiter. Your mission is to beam down to Earth, infiltrate the Tricomplex security system, avoid the various battle droids, find your way to the Pacific Ocean hideout, and throw the four main power switches. Sound simple enough?

Bring a lunch.

Although it fits into the broad category of maze games, *Mainframe* adds several clever movement routines and demands enough strategic thinking to earn a look from anyone interested in serious gaming.

As the game begins, you'll find yourself aboard the Orbiter space station. Before you can do anything else, you'll have to find a way to put on the power suit. Once you have it on, you call up the action menu. This is a series of message boards from which you can beam down, energize the power suit, remove the suit, or raise the Orbiter's

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defensive screens. You can also check the status of Orbiter, assemble an assault system, place or remove a scan unit, or transport to a scan unit. Though the menu may seem complex, it's not.

Mainframe *earns the attention of anyone interested in serious gaming.*

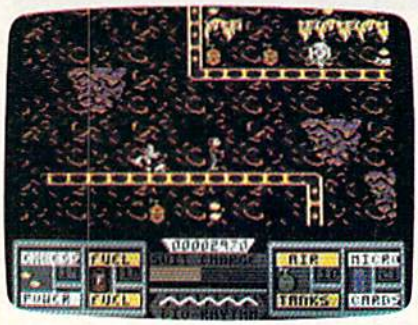
Movement in the game is accomplished via a transporter beam. Running and jumping are other ways of getting about, and you'll do a great deal of both. Running is necessary to reach and explore all the buildings and caverns, while jumping is your prime method of negotiating the many vertical mazes. As you're doing this, various battle droids will appear in your path, and you'll have to be quick enough to shoot them before they collide with you.

Transporting, more commonly called *teleporting*, is a safer means of travel, but you must transport to a scan unit, and you have only six of them. You should deposit your scan units in strategic spots that may require more than one visit, such as the place where you assemble your assault device. Once your scan units are in place, you can roam about collecting the pieces for the assault device and then instantly transport them to a common assembly point.

As if it weren't enough for you to piece together three assault devices (one each for air, land, and water), you'll also need to search for power pods (to supply power to both the Orbiter and your power suit), fuel to drive your devices, underwater air tanks, and microcards to open security doors. That's not all. You'll have to protect the Orbiter by raising its shields—which use up power—and by disabling the four ground-air lasers used by Tricomplex to attack the Orbiter. When you're hurt, you'll have to beam up to the Orbiter and visit the medical lab to be rejuvenated. And since Tricomplex is capable of repairing itself and its systems, you may have to disable some systems more than once.

Make it a big lunch.

The joystick controls all the action and menu selection. The graphics and animation are high quality, as is the sound, which includes a background song that can be toggled on or off. At the bottom of every screen, a status section indicates your levels of power, fuel,



air, and power-suit charge. The documentation is minimal, but it doesn't leave out any of the game's features, and you'll find that the story doesn't go on so long that it becomes overbearing or pretentious.

In the end, *Mainframe* uses the maze format as a jumping-off point to create a game demanding arcade skills, strategic thinking, and the ability to solve problems. That's quite a lot for a game that doesn't rely on heavy keyboard input, but the designers have managed it very well.

—Ervin Bobo

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From Baltic Avenue to Park Place

Virgin Games has released *Monopoly*, the computerized version of the Parker Brothers' board game. The modern version remains faithful to the original game, but the computer calculates rent, arranges mortgages, conducts auctions, and acts as banker.

The new *Monopoly* features a time clock and quick-move option, a musical score, and color graphics. Players will find the same street names, tokens, and the familiar Chance and Community Chests from the board game. As in the original game, the object is to amass great fortunes by buying and selling railroads, utility companies, and properties of all types. Players can compete against computer opponents, other human opponents, or a combination of both. One to eight players can participate.

The suggested retail price is $29.95. Virgin Games are distributed exclusively by Electronic Arts under its Affiliated Labels program.

Electronic Arts, 1820 Gateway Dr., San Mateo, CA 94404
Circle Reader Service Number 200.

Quick Brown Box Device Driver

Herne Data Systems has released *QDisk* version 2.0, a device driver for Brown Boxes' Quick Brown Box. The device driver allows the Quick Brown Box to be used as a nonvolatile ramdisk in the C-128 CP/M mode. The application-transparent *QDisk* can be used with all standard CP/M software such as *PIP*, *WordStar*, and *dBase*.

The Quick Brown Box, a battery-backed CMOS static-RAM cartridge, is available in 16K, 32K, and 64K sizes. Its internal lithium battery retains the contents of the RAM for up to ten years, even when the cartridge is unplugged from the computer.

QDisk allows users to utilize the entire 64K version as a single CP/M drive. It also allows partitioning of the 64K Quick Brown Box into two 32K areas, either one of which can be used as a separate CP/M drive. Once the driver is installed, the Quick Brown Box can be accessed as a normal CP/M disk drive.

The suggested retail price of *QDisk* is $9.95. The 16K, 32K, and 64K Quick Brown Boxes sell for $69, $99, and $129, respectively.

Herne Data Systems Ltd., P.O. Box 714, Station C, Toronto, Ontario, Canada M6J 3S1

Brown Boxes, 26 Concord Rd., Bedford, MA 01730
Circle Reader Service Number 201.

Twin Kick

Data East has put two of its most popular software titles together in one package. *Karate Champ* and *Kung Fu Master*, both based on coin-operated arcade games, have been bundled together for the Commodore 64.

In *Karate Champ*, players must try to retain the championship title by using kicks, spins, somersaults, foot sweeps, reverse punches, and defensive blocks to defeat another player or a computer-controlled opponent. The martial arts adventure features nine different settings and three bonus screens.

Players of *Kung Fu Master* have to battle against martial arts experts and demons to rescue a captive fair maiden from the wizard's castle. During the mission, players encounter dragons, snakes, killer bees, and henchmen. The player has to defeat five opponents to advance to each of the five levels of the game.

The package includes both products on separate disks for the suggested retail price of $14.95.

Data East USA, 470 Needles Dr., San Jose, CA 95112
Circle Reader Service Number 202.

Data East's Karate Champ *and* Kung Fu Master *are now available in one package for $14.95.*

Phonics Phun

Gamco Industries has released *Clue In on Phonics* for students in kindergarten through grade 4. The disk contains 15 sequenced lessons and uses a Sherlock Holmes theme to reinforce phonics skills including identifying both single-consonant sounds and short-vowel sounds and making word families.

Students use an onscreen magnifying glass to identify blends and digraphs in words or to add blends and digraphs to various letter patterns to make words. In the lessons on vowels, students compare and match the sounds of vowel digraphs and dipthongs. They can also identify

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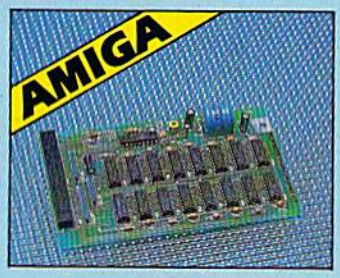

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- With calendar/clock onboard time/date automatically booted
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- A 500 or 1000 please state.
- 1.2m length.

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ACTION REPLAY IV THE ULTIMATE UTILITIES/BACK-UP CARTRIDGE FOR THE 64/128

• Action Replay allows you to Freeze the action of any memory Resident Program and make a complete back-up to disk or tape – but thats not all . . . . Just compare these features

- Simple Operation: Just press the button at any point and make a complete back-up of any* memory resident program to tape or disk.
- Turbo Reload: All back-ups reload completely independantly of the cartridge at Turbo speed.
- Sprite Monitor: View the Sprite set from the frozen program – save the Sprite – transfer Sprites from one game to another. Wipe out Sprites, view the animation on screen. Create custom programs.
- Sprite Killer: Effective on most programs – make yourself invincible. Disable Sprite/Sprite/Backround collisions.
- Unique Picture Save: Freeze and save any Hires Screen to tape or disk. Saved in Koala, Blazing Paddles Format.

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POWERFUL DESIGN WITH ON BOARD LSI LOGIC PROCESSOR CHIP PLUS 40K OF ON BOARD ROM/RAM!

- Compactor: Efficient compacting techniques – 5 programs per disk side – 10 programs if you use both sides.
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- Compatible: With Fast DOS and Turbo Rom Systems
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- Unique Restart: Remember all of these utilities are available at one time from an integrated operating system. A running programme can be Frozen to enter any Utility and the program is restarted at the touch of a key – without corruption.

LSI Logic Processor: This is where Action Replay IV gets it's power. A special custom LSI chip designed to process the logic necessary for this unmatched Freeze/Restart power. No other cartridge has this power!

UNIQUE FEATURES:

WARP 25

Loads 50K in under 5 seconds!!

The it true action replay features "Warp 25" the world's fastest disk serial Turbo. A typical backup will reload in under 5 seconds.

● No additional hardware required ● No special formats ● Super reliable ● Remember this is not a system where files have to be converted – with action replay you simply save directly into Warp 25 status – reload in seconds. ● Backup all your existing programs to load at unbelievable speed!! ● Because AR4 has on board ram it can also load commercial disks directly at 25 times speed.

This is unique to Action Replay!!

● Warp Save/Load Available straight from Basic

Plus unique Code Cracker Monitor

● Freeze any program and enter a full machine code monitor ● Full Monitor Features – Disassemble, Hex, Find, Jump, Compare, Replace, Two Way Scroll, Full Disk Load/Save, Printer Support etc. In fact all usual monitor commands plus a few others. ● Because of Action Replay's on Board Ram the Frozen program can be looked at in it's ENTIRETY: – In it's Frozen state. That means Video Ram, Zero Page etc. and remember you see the code in it's Frozen state not in a Reset state as with competitors products. ● Restart the program at any point. ● No corruption ● An absolute must for the program Hacker – make changes and see your result's instantly!

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To help take advantage of action replay's unique power to freeze any screen and save it into your favourite graphics package we have prepared a suite of graphic support facilities.

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ONLY $19.99

CENTRONICS PRINTER LEAD

Take full advantage of Action Replay or Final Cartridge screen dump features with this centronics lead.

Connects user port to any full size Epson compatible printer.

ONLY $18.99

SUPERCRUNCHER

A utility to turn your Action Replay into a super powerful program compactor. Reduce programs by up to 50%! Save disk space and loading times. Can even further compact programs already crunched by Action Replay's own compactor.

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NOW WITH RAMLOADER™

Not only can Action replay load your backups at 25 times normal speed . . Now with the new RAMLOADER feature you can also load most of your commercial originals also at 25 times faster!

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- Unique picture print dump – compressed/enlarged.

Plus other effects.

- Fast loader – loads commercial software at up to 15 times normal speed.
- Range of desk-top type tools – clock, calculator, desktools etc. etc.
- Final Cartridge 3 is a superb utilities cartridge with an added bonus of a freezer function.

ONLY $54.99

TOOLKIT IV

The ultimate disk toolkit for the 1540/1541

- A disk toolkit is an absolute must for the serious disk hacker. Toolkit IV has more features than most for less.
- DISK DOCTOR V2 – Read and write any track and sector including extra and renumbered tracks. Repair damaged sectors. Look underneath read errors.
- HEADER/GAP EDITOR – Decodes and displays ALL header information including off bytes and header gap. Rewrite the entire header and header gap. Renumber sectors. Also edit any sector tail gap.
- DISK LOOK – Sort directory. Recover lost files. Display file start/end addresses. Disassemble any file program directly from the disk to SCREEN or PRINTER including undocumented opcodes. Edit Sam. Much, much more.
- FILE COMPACTOR – Can compact machine programs by up to 50%. Saves disk space. Compacted programs run as normal.
- FAST DISK COPY – Copy an entire disk in 2 minutes or less using single 1541.
- FAST FILE COPY – Selective file copy. Works at up to 6 times normal speed.
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Compatible with most leading MIDI software.

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Turbo Rom II is a replacement for the actual kernal inside your 64. It provides superfast load/save routines.

- Loads/Saves most programs at 5-6 times normal speed.
- Improved DOS support including 10 sec format.
- Programmed function keys:- load, directory, old, etc.
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- Now you can select from any of 8 32K EPROMs.
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- Directory of utilities on power up.
- Fully menu driven on power up.
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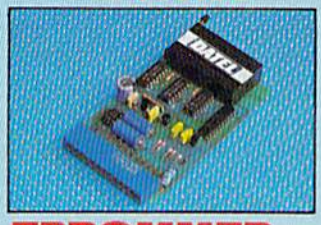

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- Will program 27256 chips. 12.5, 21 or 25 volts.
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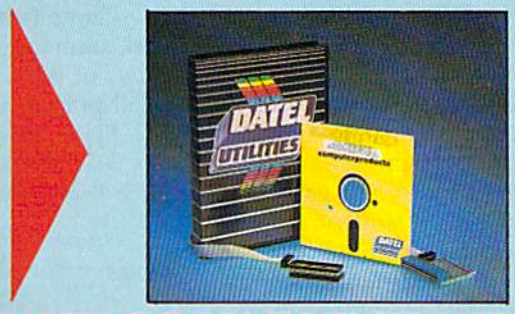


DEEP SCAN BURST NIBBLER™

- The most powerful disk nibbler available anywhere, at any price!
- Burst Nibbler is actually a two part system – a software package **and** a parallel cable to connect the 1541/1570/1571 to 64/128 (state type).
- What gives Burst Nibbler its power? Conventional nibblers have to decode the data from the disk before it can transfer it using the serial bus – when non standard data is encountered they are beat. Burst Nibbler transfers data as raw GCR code via the parallel cable without the need to decode it so you get a perfect copy of the original.

- Will nibble upto 41 tracks. ● Copy a whole disk in under 2 minutes. ● Full instructions.
- Regular updates – we always ship the latest. ● Fitted in minutes – no soldering usually required.
- Full or ½ tracks. ● No need to buy parallel cable if you have Professional DOS etc.
- Cable has throughbus extension for other add ons.

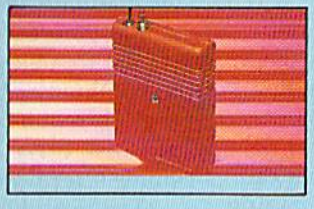
ONLY $39.99 COMPLETE

SOFTWARE ONLY $19.99 CABLE ONLY $19.99

BURST NIBBLER PARAMETER DISK

- Burst Nibbler is the most powerful Nibbler around – but even the best can be better – This disk contains dozens of parameters specially written for the protection schemes impossible to Nibble. These are mainly 'V-max' and 'Rapidlock' and include titles such as 'Defender of the Crown', Gauntlet etc. – Regularly updated to include any new titles. – This disk is by no means a necessity – the standard Burst Nibbler will copy 98% of software as is – if you want to go to the limits, this is the product for you!

ONLY $14.99



SMART CART

- NOW YOU CAN HAVE A 32K CARTRIDGE THAT YOU PROGRAM LIKE RAM THEN ACTS LIKE ROM!
- 32K pseudo ROM – battery backed to last up to 2 years (lithium battery).
- Simply load the program you require – then flick the switch. The cartridge then acts like a ROM cartridge and can even be removed.
- Make your own cartridges – even auto start types, without the need for an Eprom burner.
- Can be switched in/out via software.
- I/O2 slot open for special programming techniques.

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DUPLIKATOR

- Duplikator is a mass disk copier ideal for clubs, user groups etc.
- Comes with 256K on board RAM and it's own built-in operating system – no software to load.
- Makes entire backups in 8 seconds!!
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- Slimline extra low profile unit – only 6" long!
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- Full Midi Interface for A500/2000/1000 (Please state model).
- Compatible with most leading Midi packages (inc. D/Music).
- Midi In – Midi Out x 3 – Midi Thru.
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words that become new words when the silent *e* is added.

Teacher options include setting the number of questions in a lesson, turning the sound on or off, deciding what score must be achieved to play the reward game, and turning the reward game on or off. Up to 200 student names and scores can be stored on the disk and arranged in alphabetical order. Teachers may view, print, or delete all or individual names.

Clue In on Phonics is available for the Commodore 64 for the suggested retail price of $44.95.

Gamco Industries, Box 1911, Big Spring, TX 79721
Circle Reader Service Number 203.

Just in Time for the Hot Stove League

Epyx has recently released a new baseball game developed under a license from the Major League Baseball Players Association and endorsed by the sports weekly *The Sporting News.*

The Sporting News Baseball features both statistical and action gameplay. Players choose their lineup from 1987's 26 major league teams or from a roster of Hall of Famers. Dream teams can be compiled by drafting or trading players from a pool of over 100 legends such as Babe Ruth and Willie Mays.

The actual capabilities of the players in the lineup and their statistics determine the action on the field. Pitchers fire fastballs and curves and can even be charged with balks. The element of pitcher fatigue has also been factored in.

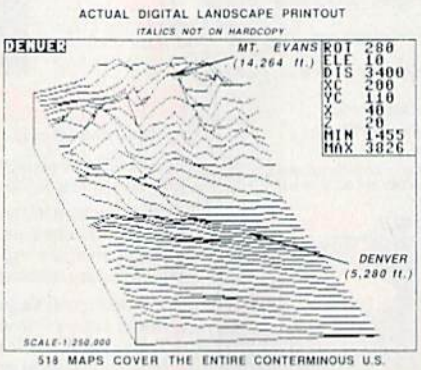
Players can swing for the fence, attempt steals, or go for extra bases. On defense, fielders can be positioned, pitchouts or intentional walks can be called, and double plays can be turned.

On-field player performances are determined by statistics such as slugging percentage, stolen bases, and fielding averages. Pitcher ratings are determined by factors such as earned run average.

Players can play and manage against the computer or challenge an opponent. A statistical mode allows players to select two major league teams and have the computer play the teams head to head.

Game features include ballpark sound effects and split-screen views of the action. The suggested retail price is $39.95.

Epyx, 600 Galveston Dr., P.O. Box 8020, Redwood City, CA 94063
Circle Reader Service Number 204.



Digital Landscape *users can view 3-D topography of any area in the U.S.*

3-D U.S.A.

Digiscape Software has released *Digital Landscape,* which allows Commodore 64 users to view in 3-D the topography of any area of the continental United States. The program requires a 1541, 1571, or 1581 disk drive and a dot-matrix printer if a printout is desired.

Data can be entered from one of Digiscape's Elevation Disks or by using a topographic map to produce 3-D renderings and horizontal or vertical cross-sections on the screen. The renderings can be rotated 360 degrees in 1-degree increments in azimuth and tilted from +1 degree to +89 degrees in declination. The scale can be varied, and vertical cross-sections can be expanded and contracted vertically or horizontally. Users can save the renderings to disk.

The Elevation Disks contain 414,000 elevations taken at regular intervals across the U.S. Users can choose from five 5¼-inch Elevation Disk sets or three 1581 drive disks. Each 5¼-inch Elevation Disk set has a suggested retail price of $29.95. All five sets can be purchased together for $99.95. The 1581 disks are available for $27.95 each. The *Digital Landscape* program disk sells for $46.95.

Digiscape Software, P.O. Box 113058, Carrollton, TX 75011-3058
Circle Reader Service Number 205.

Absolute Simulators

Absolute Entertainment has released new space-flight and fighter-pilot simulator games, *Garry Kitchen's Star*Fighter* and *F-18 Hornet,* for the Commodore 64.

*Star*Fighter* provides players with a fusion-powered intergalactic interceptor space fighter armed with particle lasers, photon torpedoes, and heat-seeking missiles. The fighter has an on-board computer system, shields, scanning capability, and computerized maps of interstellar space.

This high-speed animated action-graphics game features a 3-D galaxy of 512 sectors including suns, star bases, armories, and planets. During the journey, players encounter asteroids, enemy ships, satellites, and hostile aliens.

The game will be available in early December for the suggested retail price of $34.95.

In *F-18 Hornet,* players start as flight cadets, flying training missions. More experienced pilots can jump right into more challenging missions. Flying assignments take players over 3-D terrain including bridges, roads, buildings, mesas, canyons, islands, hangars, and ships. Landings must take place on an aircraft carrier.

The suggested retail price for *F-18 Hornet* is $34.95.

Both Absolute Entertainment games are distributed by Mediagenic.

Mediagenic, 3885 Bohannon Dr., Menlo Park, CA 94025
Circle Reader Service Number 206.

Keyboard Control

Omni Enhancements has introduced the Command Post, which fits over the keyboard cursor keys and operates like a joystick. All keyboard applications software and games that use keyed cursor controls can be used with the Command Post.

In addition to the cursor controller, the package includes a free game disk. Command Post is compatible with Commodore computers and has a suggested retail price of $11.95.

Omni Enhancements, P.O. Box 874, Veradale, WA 99037
Circle Reader Service Number 207.

Evolution (ev´ e-lōō´ shen) n. The process of growing or developing to a higher state.

INTRODUCING THE NEXT STEP IN CARTRIDGE EVOLUTION!

It started with... SUPER SNAPSHOT V2

"...probably the most advanced on the market..."
Morton Kevelson, Ahoy! Nov '87

"...useful...fun...exceptional quality..."
David Martin, RUN Dec '87

"All in all, I think this is the best of the bunch." *Tim Sickbert, INFO Jan '88*

followed by... SUPER SNAPSHOT V3

"Snapshot + Slideshow = a dynamic duo!" *Sue Albert, INFO May/June '88*

"...one of the most technically advanced...packed with useful features..."
Art Hunkins, Gazette June '88

"...my personal favorite is Super Snapshot."
Morton Kevelson, RUN Sept '88

"Hats off to LMS Technologies. They make a good product."
John Christensen, Input

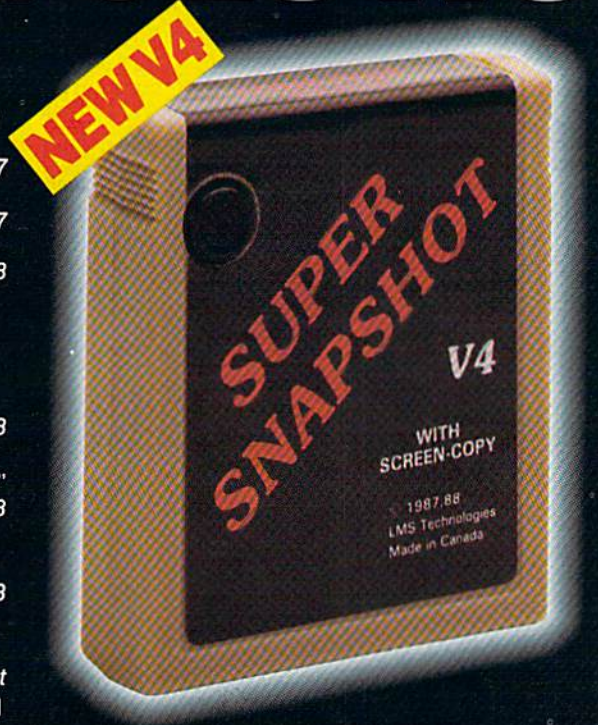
"The monitor that made me give up all the others."
Lawrence Hiler, Chip Level Designs (formerly of Basement Boys Software)

"...indispensable, can't live without it."
Bob Mills, programmer of Renegade

...and now we bring you SUPER SNAPSHOT V4

With even MORE of the power-packed utilities you've come to expect from the makers of the most popular utility cartridge in North America!
Available **Nov. '88**
Super Snapshot is used by INFO in producing their magazine.

▸ Version 1, 2, and 3 owners may upgrade to version 4 for $20.00 CALL US! ▸ C128 disable switch, add $8.00 ▸ 10-day, money back guarantee.



ALSO AVAILABLE: SUPER SNAPSHOT SLIDESHOW CREATOR

Powerful options within this package allow you to create slideshows using Snapshotted screens to produce dazzling effects in eye-catching presentations. Options include: displays that can fade in/out, shutter on/off, pop on/off, or slide on/off. Use any of 10 different fonts to display your personalized, scrolling message -ANYWHERE ON THE SCREEN! Slideshow can even be incorporated into your BASIC and ML programs.

"Slideshow and Snapshot are a power partnership."
Sue Albert, INFO May/June '88

"...a gem of a companion: Slideshow Creator... well-designed..."
Art Hunkins, Compute!'s Gazette June '88

Super Snapshot V4 - $64.95
Super Snapshot Slideshow Creator - only $14.95

EVOLUTION OF FEATURES

▸ Works with all 64(C), 128(D), 1541(C), 1571, 1581 ▸ Totally transparent when disabled ▸ Turbo load and save (1541, 1571, 1581): 15x faster loading, 7x faster saving; 25x faster loading with TURBO*25 ▸ Super DOS wedge: all standard commands PLUS extras. Supports devices 8, 9, 10, and 11 ▸ Function keys: pre-programmed and re-programmable **(now 13 f-keys)** . ▸ Archiver: saves all memory-resident programs to disk as 1 or 2 autobooting files ▸ Screen Copy: dump to disk in popular graphic program formats or to printer in 3 sizes **(print sprites, more printers supported).** Dumps BOTH multi-colour and hi-res screens (STILL the only utility cartridge of it's kind to do both!) ▸ M/L monitor: DOES NOT CORRUPT MEMORY! Interrupt, examine, modify, and resume a running program. All standard commands PLUS bank-switching, bi-directional scrolling, IO command, track and sector editor, **ASCII hunt, and drive monitor** ▸ Sprite disable and extended life feature. **Now includes sprite re-enable (unique to SS V4)** ▸ **Sprite monitor and full-featured sprite editor** ▸ Fast disk copier: 1 or 2 drives; supports 1541, 1571, and 1581 ▸ **Basic Aids: append, auto, autodata, menu, merge, old, pron, proff, tron, troff, renum** ▸ **File Management System: fast file copier (1541, 1571, 1581 -including partitions, 1 or 2 drives, any combination); scratch, rename, PLUS expert mode** ▸ Free Kracker Jax 100+ parameter disk including nibbler (for those tough back-ups).

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LMS TECHNOLOGIES

In Canada order from: Marshview Software, PO Box 1212, Sackville NB E0A 3C0 (506) 536-1809 SS V4 $69.95 Slideshow Creator $19.95

Or call our toll-free order line at 1-800-356-1179, 9am-5pm Pacific time, Monday-Friday. After hour orders accepted at (206) 695-9648 7 days a week. Technical support available. Call (206) 695-9648, 9am-5pm Pacific time, Monday-Friday.

Rally Racer with Track Editor

Scott Elder

The torturous hairpin turns and high-speed straightaways in "Rally Racer" promise to separate amateur racers from the pros. Included is a track editor for designing your own courses and saving them to disk. For two players. Two joysticks and a disk drive are required.

There's nothing like driving a racecar. The scenery is a blur as you drive by at high speeds—the wind in your hair, your foot heavy on the gas pedal. Just when you're getting used to the calm of the straightaway, your foot's on the brake for a dangerous hairpin turn.

"Rally Racer" brings the thrill of auto racing to your computer. And you can compete with a friend in this uniquely designed race. When you're ready for a new track, design your own with Rally Racer's built-in track editor.

Typing It In

Program 1 is written in BASIC. Since the program contains many DATA statements, enter it using "The Automatic Proofreader," found elsewhere in this issue. When you've finished typing, be sure to save a copy of the program to disk.

Program 2 is written in machine language. Enter the program with "MLX," the machine language entry program found elsewhere in this issue. The MLX prompts, and the values you should type in, are as follows:

Starting address: C000
Ending address: CACF

Before exiting MLX, save a copy of Program 2 to disk with the name RALLYCODE. Program 1 expects a program of this name to be on the disk when it runs.

Start Your Engines

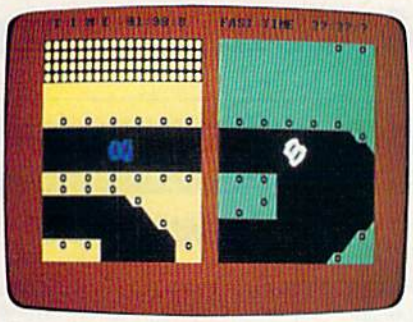
When you're ready to play Rally Racer, plug in two joysticks. Load and run Program 1 (Program 2 will be loaded automatically). After the sprites and racetrack are constructed, you'll see the following menu:

1. **Race**
2. **Edit Track**
3. **Load Track**
4. **Save Track**
5. **Save Track & Fast Time**

For now, press 1 to race. The player with joystick 1 controls the blue car; joystick 2 drives the white car. The screen is divided into two sections. The left half is blue's screen; the right is white's screen. Although both players race at the same time, you can't collide with your opponent.

Make your way through the racetrack. Steer your car by pushing left to turn your car counterclockwise or right to turn clockwise. Push forward to shift into first gear;

push forward again to move into second. When you're heading for a hairpin curve, you'll want to slow down. Pull back on the stick to downshift into first. Pull down again to brake.



Two cars race down a custom track in "Rally Racer."

Near the top of the screen is a timer. When one player finishes the course, the timer stops. The day's fastest time is also displayed near the top of the screen.

After the game, you'll return to the Rally Racer menu.

The Fast Lane

Rally Racer makes it easy to design your own tracks. Select Edit Track from the menu and you'll see a representation of the default track. Use the joystick plugged into port 2 to move around the track. By pressing the fire button, you can toggle the state of the pixel. An *off* pixel represents the track. An *on* pixel designates an area that is out of bounds (you can't drive there). Press F1 to fill the entire track and F3 to clear the track.

There are two sections of track that must be part of your course. These are the starting point and the half-lap point. You'll find that it's impossible to fill in these two points. When you've finished designing your racetrack, press RETURN.

Now you're ready to try out your redesigned racetrack. You'll want to make sure that it's possible to finish the course. You can save your track from the menu, load tracks from the menu, or even save a track along with the best time for that course.

For your first attempt at designing a course, it's a good idea to start with the default course and make a few small changes at a time. *See program listings on page 86.*

USER GROUP Update

Mickey McLean

The following list includes updated entries to our annual "Guide to Commodore User Groups," which last appeared in the May and June 1988 issues.

Send typed additions, corrections, and deletions for this list to

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Attn: Commodore User Groups

When writing to a user group for information, please remember to enclose a self-addressed envelope with postage that is appropriate for the country to which you're writing.

User Group Notes

The **Fairfield Commodore Users Group** has changed its address to P.O. Box 2778, Fairfield, California 94533. The group has also added a 24-hour bulletin board service. Its telephone number is (707) 446-7235.

The new mailing address for the **Manchester Commodore Users Group** is P.O. Box 1641, Manchester, New Hampshire 03105.

New Listings

CALIFORNIA

Mother Lode Commodore User's Group, P.O. Box 1286, San Andreas, CA 95249

ILLINOIS

Great Lakes Commodore Club, P.O. Box 322, Lake Bluff, IL 60044 (BBS# 312-473-1820)

MICHIGAN

West Michigan Commodore Users Group, P.O. Box 88191, Kentwood, MI 49508

NEW YORK

Universal Processing Institute, 45-45 220th St., Bayside, NY 11361

Quicksilver Users International Commodore Knights (Q.U.I.C.K.), 33 Smith Ln., Centereach, NY 11720

OREGON

C.U.A., P.O. Box 531, Medford, OR 97501

VIRGINIA

Commodore Game Players International, 2507 S. Ridge Dr., Midlothian, VA 23112

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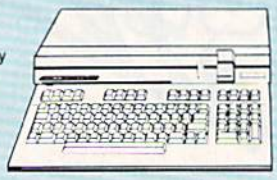

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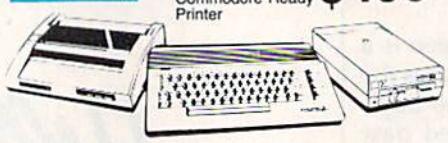

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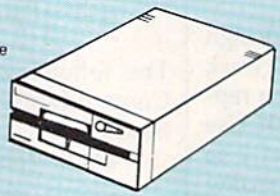

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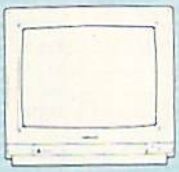

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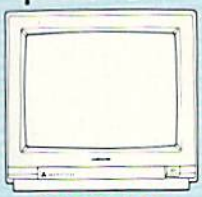

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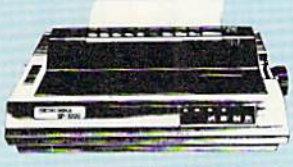

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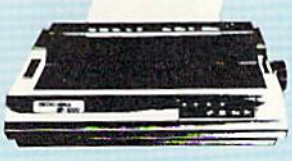

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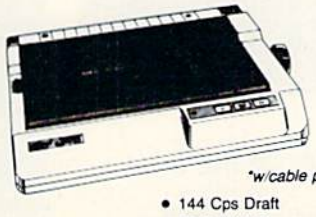

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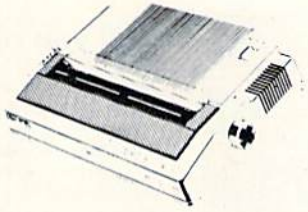

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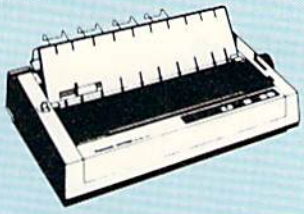

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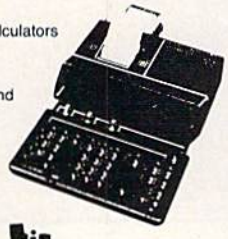

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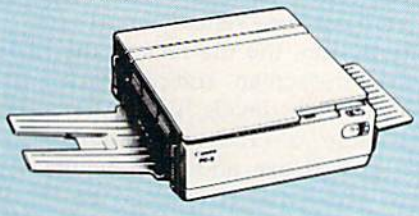

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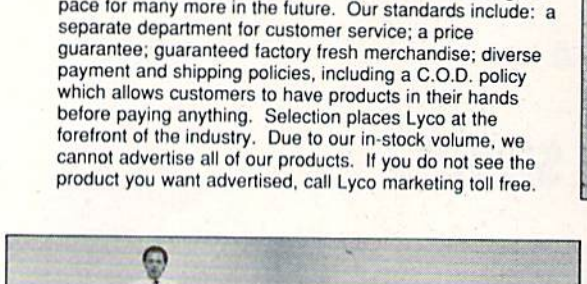

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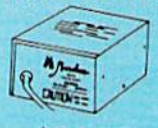

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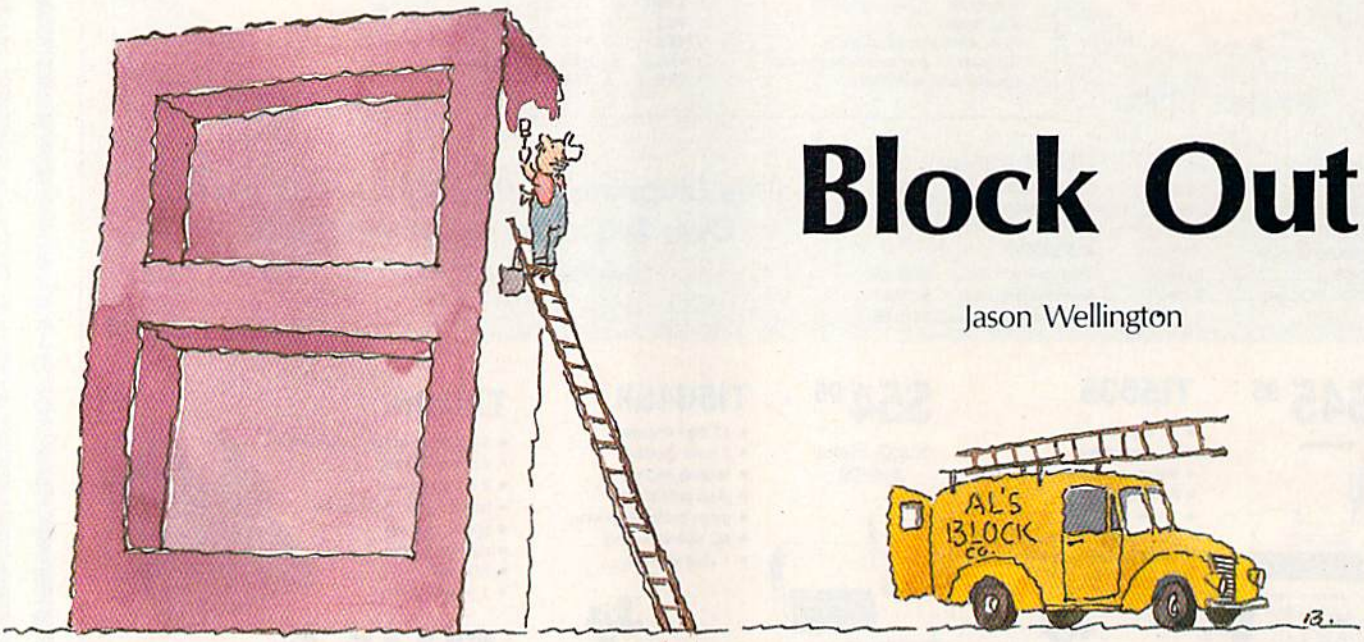


Block Out

Jason Wellington

Here's a challenging mental exercise for 128 owners—a colorful strategy game for two players that features outstanding graphics and playability. A disk drive and two joysticks are required.

Start with dozens of tiles, emboss one of four patterns onto each tile, and then paint each with one of five colors. What do you have? The makings of "Block Out," an addictive strategy game that's so easy to learn that everyone in the family will want to play.

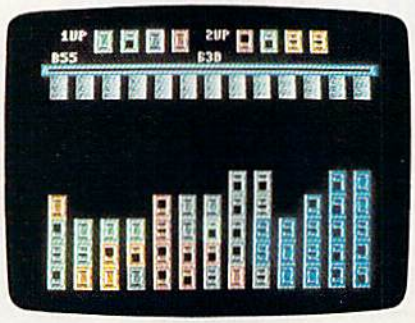
In Block Out, players compete for points as they build a wall of tiles. You get points for placing blocks of the same color or pattern next to each other. You get more points if both the color and the pattern match.

Getting Started

Block Out is written in BASIC. Before typing in Program 1, be sure that you are in 128 mode. When you've finished typing, save a copy of the program to disk.

Block Out requires a data file (Program 2) for its sprite definitions. Use "128 MLX" to enter this file. When MLX prompts you, respond with the values given below.

Starting address: 0E00
Ending address: 0FFF



Match colors and patterns for high scores in "Block Out," an elegant game of strategy.

After you've typed in the data, save Program 2 with the filename SPRITES. The BASIC program expects to find a file of this name.

To play Block Out, plug two joysticks into your computer. Then load and run Program 1. You'll see Block Out's title screen. Press any key to start the game.

You and your opponent will each receive a rack of four tiles. Each tile has one of four patterns embossed upon it. Each tile also has a color: red, gray, orange, green, or blue. Players alternate turns in Block Out; player 1 always moves first.

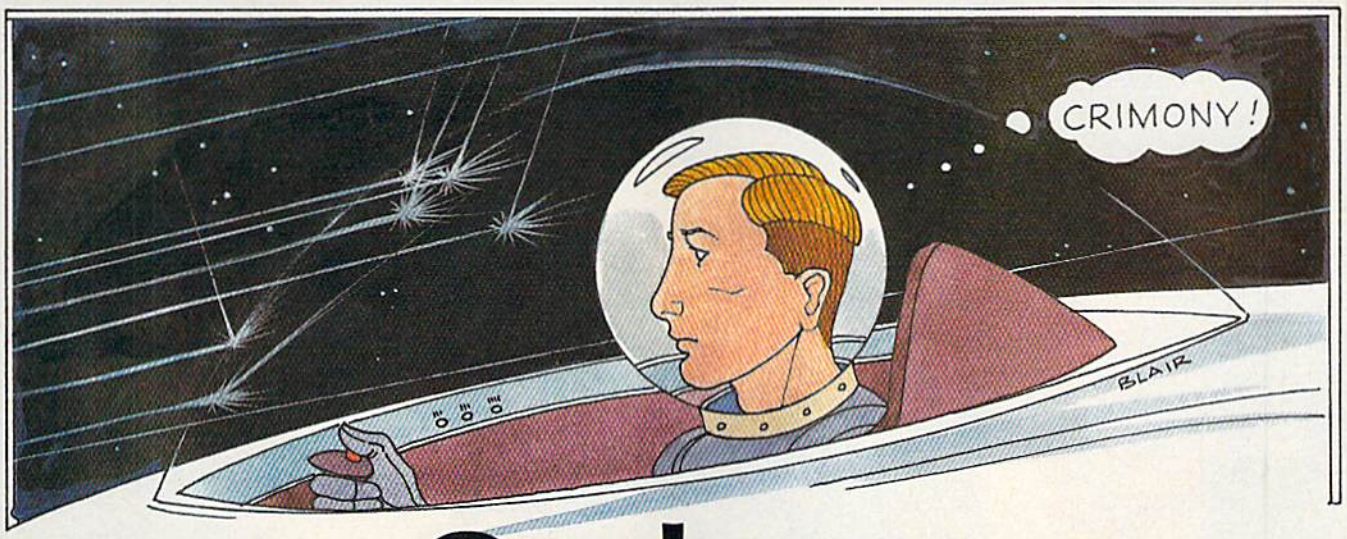
When it's your turn, use the joystick to move to one of your four tiles. Press the fire button to select the tile. (To show that you've picked it up, the tile disappears from your pile.) Now move the joystick-controlled pointer to one of the 13 gray chutes. When you press the fire button, the tile falls to the bottom of the screen. You can stack tiles up to eight levels high. After you've made your move, the points you've scored are added to your current score and displayed beneath your rack of tiles. A new tile then appears in your rack.

Ways to Score

When you drop a tile next to (or on top of) a tile of the same color (but of a different pattern), you're awarded 15 points. If the tile is of the same pattern (but a different color), you get 25 points. If the tiles match in both pattern and color, you score 40 points. Since dropped tiles can touch other tiles in three directions (left, right, and down), the maximum score per play is 120 points.

When all the chutes have been filled, the player with the higher score is declared the winner.

See program listings on page 85.



Quolerus

James Knesek

Fight against an evil empire in this dazzling, futuristic arcade-action game for the 64. Disk drive and joystick required.

Many light years from Earth, near the rim of the Milky Way galaxy, a solar system called Quolerus spins silently in the vacuum of space. Quolerus is not an unusual system in terms of composition (a single star and five planets), but it is unique in situation.

Quolerus, having no inhabited planets, is rich in certain minerals that are used to make interstellar flight affordable. Two nearby inhabited systems, Daertes and Gliphos, had been mining the planets of Quolerus for eons. Last year, a previously unknown race called the Knarbots erected a force field around Quolerus so that they might mine the system alone.

You, a young hero of Gliphos, have designed a powerful new space fighter. You must break down the force fields of the Knarbots while evading their interplanetary forces.

When you play "Quolerus," you're not just trying for a high score; you're fighting for justice.

Typing It In

Quolerus consists of three programs. Program 1 is written in BASIC. Using "The Automatic Proofreader," carefully type it in. When you've finished typing, save the program to disk.

Programs 2 and 3 must be entered with "MLX," the machine language entry program found elsewhere in this issue. Program 2 is the sprite data for the game. Program 3 is machine language code. When MLX prompts you, respond with the values given below.

Program 2
Starting address: 3000
Ending address: 3607

Program 3
Starting address: C000
Ending address: CB7F

When you've finished typing in Program 2, save it with the name QUOLERUS.SPR. After you've typed in Program 3, save it with the name QUOLERUS.ML.

When you're ready to play Quolerus, plug a joystick into port 2. Then load and run Program 1. Programs 2 and 3 will automatically be loaded.

A Never-Ending Battle

The object of the game is to destroy the Knarbot mother ship, found at the left side of the screen. To do this, you must first destroy the deadly moving walls while avoiding the Knarbot drones released by the mother ship.

Your ship can move and fire in eight directions. To move, press the joystick in the direction in which you wish to travel. Press the fire button to shoot.

Fire at the Knarbot walls. You'll receive 50 points for each segment you destroy. When Knarbot drones are released, shoot them for 100 points each. You can also shoot the bullets fired by the drones. For this, you'll receive 50 points. When you've shot enough of the walls away, you may get a chance to fire at the mother ship. If you can shoot it down, you'll be awarded 2000 points.

Fierce aliens and a deadly wall protect the mothership in "Quolerus."

Skill level 1 begins with four layers of wall and a single Knarbot ship. If you break through the walls and destroy the mother ship, you'll move on to the next level. As you progress through each level, you'll encounter greater hazards—more walls and more Knarbot ships. You'll get a bonus ship every 10,000 points.

Good luck. The fate of two solar systems rests on your shoulders.

See program listings on page 91.

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Do you have a question or a problem? Have you discovered something that could help other Commodore users? We want to hear from you. Write to Gazette Feedback, **COMPUTE!'s Gazette,** *P.O. Box 5406, Greensboro, North Carolina 27403. We regret that, due to the volume of mail received, we cannot respond individually to programming questions.*

Take This, But Leave That

I am thinking of upgrading to an Amiga 500. I have a Commodore 128, a 1571 disk drive, RGB and composite monitors, a Canon PW 1080-A printer, Super Graphix Jr. interface, and a Hayes-compatible 300/1200 baud modem. I was wondering what I can keep and what isn't compatible with the Amiga. Can you help?

P. C. Beazley
Odessa, TX

The Amiga comes with a built-in disk drive. You cannot use the 1571 (or any drive intended for use with the 128) as a second drive for your Amiga. The Amiga uses standard parallel printers (the same kind that work with IBM PCs), so your printer should hook up directly to the back of the computer; no interface is necessary. Likewise, your modem should plug into the Amiga's serial port.

A good rule of thumb for moving peripherals from the 64 or 128 to another computer (be it Amiga, PC, or Atari ST) is this: If the peripheral is designed especially for the 64 (for example, the 1571 disk drive, the 1525 printer, the 1670 modem), it won't work on other types of computers. If you need a special interface to use the peripheral with your 64, it probably will work.

The question about the monitor is the trickiest one. The Amiga puts out an analog RGB signal. Any monitor that accepts such a signal can be used. You didn't specify which monitor you have. The Commodore 1080, 2002, and 1084 monitors can be used with the Amiga. Others, such as the Commodore 1701 and 1902, cannot. A composite monitor can also be used, but the image you see will be monochrome.

Since you'll still have your 128, disk drive, and at least one monitor, we suggest that you hold onto your 128. Remember, the software you have for your 128 will not run on the Amiga—and the 128 is an excellent computer in its own right.

Machine Language to DATA

I'd like to know how to read a machine language routine from a disk and convert it into DATA statements. Then I can insert the DATA statements into a BASIC program and call it without having to load the routine from the disk. Can you help?

Michael L. Gatto
Los Angeles, CA

One way to create a BASIC loader is to use commands from "MetaBASIC Plus," which was published in the February 1987 issue of GAZETTE *and again in the 1988 edition of* The Best of COMPUTE! and GAZETTE.

*Before you begin, you need the starting and ending addresses of your machine language (ML) routine. To determine its starting address, use the START command. To determine the ending address, enter LOAD"*filename*",8,1 where* filename *is the name of the machine language file. Then, use the END command.*

Next, use the MAKEDATA command to convert the machine language routine into DATA statements. For MAKEDATA to work properly, the ML routine that you're converting must be in memory. Also, be sure to type NEW to reset BASIC's pointers before using the command. After MAKEDATA has finished, renumber the DATA statement lines with RENUM and merge them into your BASIC program with MERGE.

Finally, add the following line to your program to POKE the machine language into memory:

10 FOR I=starting address TO ending address−1:READ A:POKE I,A:NEXT

(The −1 after ending address *is necessary because the address provided by the END command is one byte higher than the actual end of the routine.)*

If you don't have a copy of MetaBASIC Plus, use the following data maker to create a BASIC loader. This program requests filenames for your machine language file and the BASIC loader you wish to create. It then reads the machine language routine directly from the disk, creates the appropriate DATA statements, and writes the routine back to disk in the form of a BASIC loader.

```
BP 10 OPEN15,8,15:INPUT"{CLR}
      {DOWN}FILENAME OF DATA";
      F$:OPEN1,8,8,"0:"+F$+",P
      ,R":GOSUB140
AJ 20 INPUT"FILENAME TO CREATE
      ";FC$:OPEN2,8,9,"0:"+FC$
      +",P,W":GOSUB140
FP 30 GET#1,LO$,HI$:LO=ASC(LO$
      +CHR$(0)):HI=ASC(HI$+CHR
      $(0)):LK$="{2 A}":BE=LO+
      HI*256
FR 40 EN=BE:PRINT#2,CHR$(1)CHR
      $(8)LK$;:FORI=1TO9:READA
      :PRINT#2,CHR$(A);:NEXTI
FS 50 PRINT#2,LK$CHR$(LO)CHR$(
      HI)CHR$(131)CHR$(32);:CT
      =1
KB 60 GET#1,A$:S=ST:PRINT#2,MI
      D$(STR$(ASC(A$+CHR$(0)))
      ,2);:CT=CT+1:EN=EN+1
QG 70 IFCT<7ANDS=0THENPRINT#2,
      ",";:GOTO60
JE 80 IF(S)THEN110
GX 90 LO=LO+6:IFLO>255THENLO=L
      O-256:HI=HI+1
DD 100 PRINT#2,CHR$(0);:GOTO50
DP 110 PRINT#2,CHR$(0)LK$;:FOR
       I=1TO5:READA:PRINT#2,CH
       R$(A);:NEXTI
GM 120 PRINT#2,STR$(BE)CHR$(16
       4)STR$(EN-1);:FORI=1TO1
       4:READA:PRINT#2,CHR$(A)
       ;
BF 130 NEXTI:CLOSE1:CLOSE2:CLO
       SE15:END
EA 140 INPUT#15,EN,EM$,ET,ES:I
       FEN=0THENRETURN
BE 150 CLOSE1:CLOSE2:CLOSE15:P
       RINT"DISK ERROR> "EN;EM
       $;ET;ES
```

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2400's are great (but quite expensive). Most users can't justify the cost difference unless they do a large amount of modem work with a service that can handle 2400 baud.

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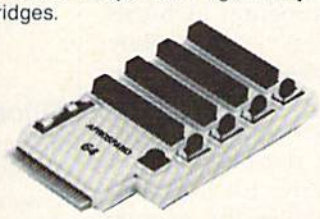

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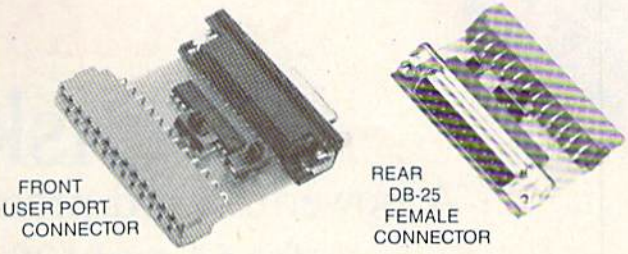

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```
JX 160 DATA 10,0,137,54,51,57,
       57,57,0
QQ 170 DATA 255,249,129,73,178
       ,58,135
KC 180 DATA 65,58,151,73,44,65
       ,58,130
BB 190 DATA 73,0,0,0
```

Moving BASIC

I am writing a program in BASIC that uses 16 sprites. I would prefer to store my sprites at 49152, but I don't want to go to the trouble of relocating the screen to this video bank. Instead, I decided to move the start of BASIC to 3072 with POKE 44,12 and use the memory below this for sprite data. When I load and run my program, I get a syntax error. What's wrong? I need help with this problem.

Darren Hembd
Port Orchard, WA

To understand why this causes a syntax error, you need to look at how BASIC handles RUN. This command (and GOTO) checks for a line number and then adjusts the BASIC text pointer (TXTPTR, locations $7A and $7B) to the byte just before the start of BASIC text.

RUN and GOTO expect the value of this byte to be 0. Why? The end of each BASIC line is signaled by a zero byte. The zero byte preceding the start of BASIC text signals RUN and GOTO that they are beginning a new line. If this byte isn't 0, they look for a valid BASIC token at TXTPTR. Since one isn't found, BASIC prints the SYNTAX ERROR message.

Doodling Around

Recently, we have found a short BASIC program that displays *Doodle* screens. It loads the picture, displays it, and then the computer locks up. Could you please tell us how to continue the program after displaying the screen? Here is a listing of our program.

```
10 IFA=0THENA=1:LOAD"DDfile-
   name",8,1
20 POKE53265,PEEK(53265)OR32
30 POKE56578,PEEK(56578)OR3
40 POKE56576,(PEEK(56576)AND252)OR2
50 POKE53272,(PEEK(53272)AND15)
   OR120
```

Tim Van Tongeren
and David Piasecki
Temple City, CA

There's nothing wrong with your program, except that it's incomplete. Line 10 loads the Doodle *file, line 20 turns on hi-res mode, line 30 sets bits 0 and 1 of CIA #2 for output (allowing you to change the video bank), line 40 changes the video bank to bank 1, and line 50 offsets the screen within this bank.*

When the program runs, you see the hi-res screen. Since BASIC's READY prompt and cursor aren't visible, the computer appears to have locked up. Actually, it's flashing the cursor and waiting for you to enter another command. You don't realize this because the text screen is not being shown.

The VIC-II chip and the text screen editor maintain separate pointers for the screen. The VIC chip pointer determines the area of memory displayed as the screen. The screen editor pointer determines where text is printed. Your program changes the VIC chip pointer but not the screen editor pointer. As a result, the text you type isn't visible.

The easiest way to restore the text screen is to save the VIC chip registers before you display a hi-res screen and later reset them when

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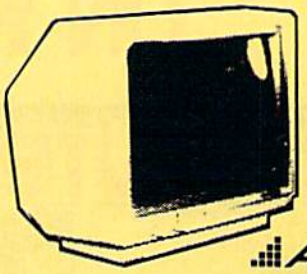

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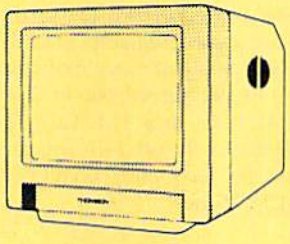

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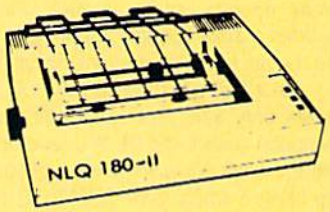

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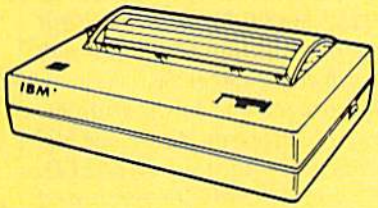

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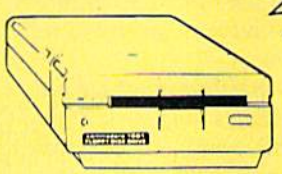

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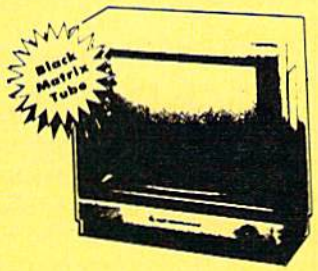

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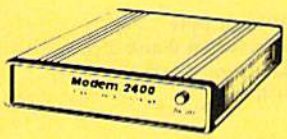

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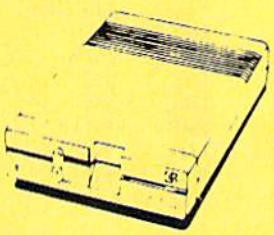

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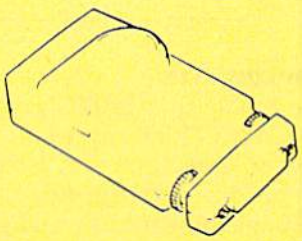

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you're finished. To restore the text screen in your program, add the following lines:

```
15 A=PEEK(53265):B=PEEK(53272):C=
   PEEK(56576):D=PEEK(56578)
60 GETK$:IFK$=""THEN60
70 POKE53265,A:POKE53272,B:POKE
   56576,C:POKE56578,D
```

Line 15 saves the pertinent VIC chip registers, line 60 pauses until you press a key, and line 70 restores the screen.

If you need both text and hi-res graphics in your program, you can easily switch back and forth between the two. If you print anything to the text screen, the PRINT routine (or more precisely, the Kernal CHROUT routine at $FFD2) uses the screen editor pointer to decide where to send the output. For you to see this output, the VIC chip and screen editor pointers must be set to the same location. To change the screen editor pointer, POKE the address of the screen divided by 256 into location 648. (The text screen must always be located at a page boundary—that is, the location must be evenly divisible by 256.) In your program, the text screen resides at 23552, so type POKE648,92.

One last thing to consider: If your program is long or uses many variables, it may eventually overwrite the hi-res screen. To prevent this, move the top of BASIC down to 23552 (POKE56,92 at the beginning of the program).

Enhancing SYS

While typing in a BASIC program from *GAZETTE* on my 64, I came across a statement that I hadn't seen before. Furthermore, this statement appeared in a slightly different form elsewhere in the program. In one case, it read SYS 49158,13,54, while in another, it read SYS 49158,H,V.

I know that SYS 49158, within this program, causes a machine language routine at location 49158 to execute. And when this routine ends, the BASIC program resumes. But what does SYS 49158,*x*,*y* do?

E. Stuart Johnson
Athens, AL

You've stumbled across an interesting trick that some programmers use to add flexibility to BASIC's SYS command. Normally, SYS simply transfers control to a machine language address that follows the SYS. Here's the trick: SYS ignores any parameters after the address. A clever programmer can read these parameters from the machine language program that SYS jumps to and then use the parameters in any way.

The statements you mentioned pass the two parameters following the SYS address from BASIC to the machine language routine at 49158. In this case, these happen to be horizontal and vertical coordinates which tell the machine language routine where to locate a playing card on the screen. When the routine executes, it immediately fetches these parameters—accepting either constants or variables—and uses them accordingly. After this, it returns control to the BASIC program.

Below is a machine language program that illustrates how such a routine works. This particular program, when called from BASIC with a statement of the form SYS 49152,START, LENGTH,BYTE fills a block of memory, from location START through location START+LENGTH, with a single byte value. Each parameter following the SYS address can be a variable, a constant, or any BASIC expression—provided it reduces to a legitimate value. Thus, A=10000:SYS 49152,30000+2*A,VAL("500"), ASC("B") has the same effect here as SYS 49152,50000,500, 66. Both fill memory from location 50000 through 50500 with the number 66.

This program is fairly straightforward. It relies on three BASIC ROM routines—located at $AEFD, $AD9E, and $BC9B—to fetch and evaluate the trailing parameters. Once these are correctly entered, a fill loop stores the designated byte into the memory block you've specified.

To use the routine in your BASIC programs, just add the following lines to each program. Line 10 POKEs the machine language routine—con-

```
;Memory fill command
;Call with SYS 49152,START,LENGTH,BYTE
;
            JSR     INTEXPR     ;get START address
            STX     251         ;Put in zero page for
            STA     252         ;indirect addressing.
;
            JSR     INTEXPR     ;get LENGTH
            STX     253         ;also store in zero page
            STA     254
;
            JSR     INTEXPR     ;get fill BYTE
            CMP     #0          ;See if it's OK. If high byte< >0,
            BNE     ERROR       ;fill BYTE is not between 0 and 255,
                                ;so display syntax error message.
            TXA                 ;.X holds the fill BYTE
;Fill loop
            LDY     #0          ;initialize .Y register
FILL        STA     (251),Y     ;fill 1 byte
            CPY     253         ;At partial page boundary?
            BEQ     LPCHEK      ;if so, then check if on last page
FILL1       INY                 ;if not, then next byte
            BNE     FILL        ;continue on current page
            INC     252         ;next page
            DEC     254         ;decrease length count by one page
            JMP     FILL        ;and continue fill on next page
LPCHEK      LDX     254         ;last page check
            BNE     FILL1       ;if not last page, continue fill
            RTS                 ;otherwise, return to BASIC
;
; INTEXPR uses three BASIC ROM calls to make a
; four-byte integer expression. This program only uses the
; lowest two bytes.
INTEXPR     JSR     $AEFD       ;get a comma
            JSR     $AD9E       ;evaluate the expression
            JSR     $BC9B       ;make a four-byte integer
            LDX     101         ;put two lowest bytes from $BC9B
                                ;into registers, low byte is in 101
            LDA     100         ;high byte is in 100
            RTS
;
ERROR       JMP     $AF08       ;print BASIC syntax error message
```

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tained in the DATA statements—into memory. Be sure to position these lines in your program so they execute before you SYS to the routine at 49152.

```
10 FORI=49152TO49213:READA:X=X
     +A:POKEI,A:NEXT
20 IFX<>9122THENPRINT"DATA STA
     TEMENT ERROR."
30 DATA 32,45,192,134,251,133
40 DATA 252,32,45,192,134,253
50 DATA 133,254,32,45,192,201
60 DATA 0,208,38,138,160,0
70 DATA 145,251,196,253,240,10
80 DATA 200,208,247,230,252,19
     8
90 DATA 254,76,24,192,166,254
100 DATA 208,242,96,32,253,174
110 DATA 32,158,173,32,155,188
120 DATA 166,101,165,100,96,76
130 DATA 8,175
```

Getting Exact Change

I use a spreadsheet on my 64. Sometimes the spreadsheet gives results which aren't exactly correct. For example: 442.654 − 441.684 = 0.969999909.

The difference between these two numbers is exactly 0.97, not fractionally less. Why does this happen? Is there something wrong with my spreadsheet?

William D. Robert
Lakeland, FL

There's nothing wrong with your spreadsheet or your computer. The reason for this lack of precision is that computers perform arithmetic using binary numbers (base 2) while being asked to express the result in decimal notation (base 10). The "error" comes about when the computer makes the conversion. While some numbers convert exactly from one number system to another, others introduce small errors. And, with repeated operations, these errors accumulate.

To understand what happens, let's consider conversion between decimal numbers and fractions. While some fractions can be converted exactly, others can't. For example, the fraction ¼ converts exactly into decimal as 0.25. However, the fraction ⅓ converts to decimal as 0.3333 . . . , with the 3s extending infinitely. An exact conversion is impossible.

Although conversions aren't always exact, they're generally very close—so close that conversion errors are usually insignificant. Also, most spreadsheets have formatting commands that can be used to round off numbers. For example, you can round off monetary values to the nearest cent. With numbers rounded, the example above becomes: 442.65 − 441.68 = 0.97, which is exactly right.

Spare Parts

For months I have been looking for a distributor who carries parts for Commodore machines. Do you know of anyone who currently offers chips or boards for the Commodore 64?

Ferhan Arican
Rochester, NY

If you have problems with your computer, it is best to take it to a qualified repair center. For the tinkerer or electronics expert, the best known distributor for Commodore spare parts is Jameco (1355 Shoreway Road, Belmont, California 94002; 415-592-8121). In some cases, extensive repairs to a broken computer cost almost as much as buying a new one. Also, remember that opening the case of your computer voids the warranty.

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BUYER'S GUIDE TO

Word Processors and Spelling Checkers

For the Commodore 64 and 128

Caroline D. Hanlon

The 64 and 128 are great game machines—but they're much more. As these computers have matured, so has the software. In stark contrast to what was available just two years ago, there are now more than two dozen word processors and spelling checkers available. And, collectively, they meet the needs and tastes of every kind of user.

For the Commodore 64

Bank Street Speller
Brøderbund
Bank Street Writer
$29.95
This spelling checker contains a dictionary with over 31,000 words to check documents created with *Bank Street Writer*. Additional words can be added to the dictionary, and wildcard searches can look for questionable words.

Bank Street Writer
Brøderbund
$49.95
Bank Street Writer features onscreen prompts, commands, and tutorials to help make it easy to use. Erase, copy, move, and other editing commands are used to create and edit documents ranging in length from a letter to a term paper.

Fleet System 2+
Professional Software
$59.95
Fleet System 2+ includes a 90,000-word spelling checker, a built-in thesaurus, a database, and a word processor derived from *WordPro*. The word processor supports onscreen word-wrap, pop-up menus, text scratch pads, custom printer drivers, and multiple drives. It also has mail-merge capabilities. The spelling checker can check four pages in less than a minute, and 10,000 words can be added to the dictionary.

Better Working WordPro
Spinnaker
$39.95
WordPro, from the Better Working series by Spinnaker, features a turbo load-and-save cartridge to speed disk access. It contains text editing and formatting commands such as margin set, indention, tabulation, centering, highlighting, underlining, double columns, insertion, deletion, search and replace, word-wrap, headers, footers, and document chaining. A 100,000-word spelling checker is included, and the program supports more than 100 printers. Documents created with *WordPro* can be used with *FilePro 64*, also from Better Working.

Better Working Word Publisher
Spinnaker
For GEOS
$39.95
Word Publisher works in the GEOS environment and is compatible with *geoPaint* and *geoFont*. It supports nine fonts and six type styles per page. Editing features include center, right, and full justification; single and double spacing; tabs; headers; footers; pagination; and word-wrap. The commands can be accessed by mouse. In view mode, the documents can be displayed as WYSIWYG. Files can be chained for longer documents, and multiple graphics can be placed on the same line. The program contains a 100,000-word spelling checker and supports more than 100 printers.

Easy Working: The Writer
Spinnaker
$9.95
This full-featured word processor includes a 100,000-word spelling checker, a disk-management feature, chapter heads, footnotes, a preview option, onscreen help, linked text, automatic page numbering, word-wrap, and editing functions such as insert, delete, cut, paste, and copy.

Fontmaster II
Xetec
$49.95
Fontmaster II for the Commodore 64 features 65 editing commands, 30 fonts, a font editor and creator, 80-column preview of text, headers, footers, page numbering in decimal or roman type, underlining, proportional spacing, and an onscreen display. This word processor can read and write PRG and SEQ text files and merge data with form letters. It also has the capability of editing right to left for foreign languages. A backup disk is included.

geoWrite 2.1 (in GEOS 2.0)
Berkeley Softworks
$59.95 ($24.95, plus $4.50 shipping, for registered GEOS 1.3 owners)

GEOS, the popular Macintosh-like operating system for the 64, contains the *geoWrite* 2.1 word processor, a text grabber, *geoMerge*, *geoSpell*, and *geoLaser*. *geoWrite* 2.1 features headers, footers, margins to eight inches, justification, centering, and search and replace. The text grabber can be used to convert text from other programs to GEOS format for modifications such as changing the font styles and adding graphics. The mail-merge program, *geoMerge*, can be used to create form letters and merge data lists with documents. It can also be used to print product inventories and price tags. The *geoSpell* spelling checker has a 96K dictionary and allows words to be added to a personal dictionary. With *geoLaser*, documents can be printed on the Apple LaserWriter laser printer with near-typeset quality.

Kidsword
Kidsview Software
$39.95

Kidsword is a large-character word processor designed for children or anyone who has trouble reading normal-size characters on a computer screen. The program prints large and standard-size characters, and the character and background colors can be changed. The screen holds ten lines of large-character text. *Kidsword* will print to Commodore and other printers.

PaperClip III
Batteries Included
Distributed by Electronic Arts
$49.95

PaperClip III provides a variety of features, plus Spellpack, a spelling checker. Phrases, sentences, and blocks of text can be moved, copied, and erased, and the whole document can be formatted for printing. A global search-and-replace function automatically changes words and phrases. Horizontal scrolling allows documents to be as wide as 250 columns, and the program offers an 80-column video display so that a complete 80-column page can be viewed. Features include columns, alphanumeric tabs, built-in arithmetic functions, headers, footers, automatic page numbering, personalized form letters, mailing-label and mailing-list capabilities, and printer commands for underlining, boldface, italic, superscripts, and subscripts. *PaperClip III* also offers a global file-copy command, a telecommunications module, and a series of menus accessible through function keys. The 64 version supports documents with as many as 202 lines. The package contains two disks—one with the 64 version and one with the 128 version—and each disk includes a spell-checking dictionary.

Pocket Writer II
Digital Solutions
$59.95

This word processor for both the 64 and 128 supports word-wrap, search and replace, mail merge, 40 and 80 columns, horizontal scrolling, global formatting, and a variety of formatting codes. The display is WYSIWYG, and the program offers 15 printer files. Enhanced versions for the 64 and 128 are available on one disk for $59.95.

SpeedScript
COMPUTE! Publications
$19.95 plus $2.00 shipping and handling (book/disk combination)
$9.95 plus $2.00 shipping and handling (disk only)

SpeedScript is a word processor published by COMPUTE! Publications in two formats: book/disk combination (book includes source code) and disk only. The disk includes more than a dozen support utilities, including a spelling checker. *SpeedScript* allows users to write, edit, format, and print documents of all sizes, from letters to novels. Margins, page length, spacing, page numbers, headers, and footers can be changed or added to the document. Formatting features include pagination, underlining, and centering. Graphics can be added to the text, and the files can be linked to print one continuous document. The program uses about 6K of memory.

Superscript
Progressive Peripherals and Software
$49.95

Superscript is a full-featured word processor that includes a spelling checker, screen-calculation capabilities, macro features, and a printer file that supports an assortment of printers. Documents can be merged with data files created by *Superbase* (a popular database also published by Progressive Peripherals).

Term Paper Writer
Mediagenic
$39.95

This program employs four major steps to help students write term papers. First, the note-taker organizes notes and information on the subject. The outliner sorts the information and prepares an outline. Writing of the document is assisted by the word processor, which supports boldface, underlining, centering, spell checking, insertion, deletion, and adding. Footnotes and a bibliography can be added to the completed document.

Textomat-64
Abacus
$29.95

Textomat-64 supports form letters, 80-column display with horizontal scrolling, and block operations. Documents with up to 24,000 characters can be stored in memory, and longer documents can be created with chaining. The commands are displayed onscreen for ease-of-use.

Thinking Cap
Brøderbund
$34.95

Thinking Cap can help a writer sort and organize notes and ideas in a logical, coherent manner. The user enters a main topic and then lists ideas under that heading. The program can then organize the topics into an outline. The built-in text editor offers automatic formatting and print enhancements such as boldface and underlining without the use of a word processor.

TRIO
Softsync Software
$29.95

TRIO is an integrated package containing a word processor, spreadsheet, and database on a single disk. Help windows provide instant onscreen instructions. Data can be exchanged and merged between programs.

Word Writer 3
Timeworks
$49.95

This word processor contains an 85,000-word spelling checker, a thesaurus with over 60,000 synonyms, an outline processor, and an 80-column print-preview mode that displays the document in 80-column format before it is printed. The menu-driven program features move-and-copy, insert, search-and-replace, page-skip, and word-wrap operations, plus automatic page numbering, document chaining, scrolling, color control, merging, centering, and a multifunction calculator. Text-printing options include underline, boldface, italics, superscript, and subscript. *Word Writer 3* is GEOS-compatible and can be used with Timeworks' *Data Manager 2* or *Swiftcalc*.

The WriteStuff
Busy Bee
Briwall
$19

In addition to the standard word processing features, *The WriteStuff* also includes a 21-function calculator, a decimal tab for aligning numbers, 60 help screens that can be customized, online disk documentation, double-column printing, sorting, merging and appending of text files, an 80-column preview screen, 24 online tutorials, and an online clock. Typists can toggle between a Dvorak and a QWERTY keyboard. More than 100 macros with one or two characters can be defined to substitute for words and phrases with up to 250 characters. A file translator can be used to convert documents to formats for 15 other word processors. A version with speech capabilities is available for $24.

For the Commodore 128

Better Working WordPro 128
Spinnaker
$39.95

The *WordPro 128* package contains the word processor and *File Pro 128*, a database manager. The word processor supports full text editing and formatting functions such as margin set, indention, tabbing, centering, highlighting, underlining, double columns, word-wrap, and search and replace. There is a 100,000-word spelling checker, and both programs can print

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to more than 100 printers. The database manager can store as many as 4000 records per file and search and sort a maximum of 20 variables. Form letters can be merged with name-and-address files to print letters and labels.

Fleet System 4
Professional Software
$79.95

This word processing package for the 128 contains all the features of its 64 counterpart, *Fleet System 2+*, plus context-sensitive help screens, RAM-expansion support, and support for four disk drives. *Fleet System 4*'s spelling checker can check ten pages in less than 45 seconds. For more information, see *Fleet System 2+*, above.

Fontmaster 128
Xetec
$69.95

This word processor contains a 102,000-word spelling checker, a foreign language disk, a font editor and creator, and more than 45 fonts, including Russian, Greek, Hebrew, and Arabic alphabets. Word processing features include PRG file merge, four keyboard macros, headers, footers, roman or decimal-type page numbers, underlining, highlighting, and help screens. Foreign languages can be edited from right to left, and fonts can be viewed on the screen before printing. The program works in 80-column mode and can print in four columns. Graphics and data can be merged into the text.

geoWrite Workshop 128
Berkeley Softworks
$69.95

All of the features of *geoWrite* 2.1 and GEOS 2.0 for the 64 (see above), plus support for the advanced features of the 128, including an 80-column display, are contained in *geoWrite Workshop 128*. It requires GEOS 128.

PaperClip III
Batteries Included
Distributed by Electronic Arts
$49.95

The 128 version of *PaperClip III* supports 80-column mode and documents with up to 499 lines. It contains a command for stripping hard returns from a downloaded text file. The flip side of the disk contains the spelling-checker dictionary and printer files. For more information, see *PaperClip III*, 64 version, above.

Pocket Writer II
Digital Solutions
$59.95

See *Pocket Writer II*, 64 version, above.

SpeedScript 128
COMPUTE! Publications
$9.95 plus $2.00 shipping and handling (disk)

SpeedScript 128 was originally published in the October 1987 issue of this magazine (available as a back issue). It is currently available on COMPUTE!'s *SpeedScript* Disk along with SpeedCheck 128, a spelling checker that lets you build a customized dictionary, and several other support utilities. Documentation is included on the disk. *SpeedScript 128* works in 80 columns and, with a few exceptions, follows the style and procedures of *SpeedScript* (see *SpeedScript*, above).

Superscript
Progressive Peripherals and Software
$59.95

Superscript is a full-featured word processor that includes a spelling checker, screen-calculation capabilities, macro features, and a printer file that supports an assortment of printers. Documents can be merged with data files created by *Superbase* (database), and the program can reside in memory with *Superbase*.

VizaWrite Classic
Progressive Peripherals and Software
$89.95

A full-featured word processor, *VizaWrite Classic* contains editing and formatting options such as justification, indention, boldface, underline, search and replace, super- and subscript, and newspaper-style columns. Text is highlighted for editing, and commands are displayed onscreen. Frequently used words can be added to the built-in spelling checker, and the glossary can be used to merge words into the text. *VizaWrite Classic* can merge name-and-address lists from any sequential file created by a database with documents. Numbers from the built-in calculator can also be added to the text. A printer profile system allows control of any RS-232 or parallel printer. The program can print near-letter-quality fonts on dot-matrix printers.

Word Writer 128
Timeworks
$69.95

Word Writer for the 128 offers a built-in 90,000-word spelling checker, a thesaurus with more than 60,000 synonyms, an outliner to organize notes, a full-function calculator, and a print-preview mode to display the document as it will print out. Word processing features include insertion, deletion, search and replace, move or copy, word-wrap, indention, tabbing, automatic page numbering, document chaining, headers, footers, superscript, subscript, scrolling, and disk cataloging. Over 1000 words can be added to the dictionary while the program is being used, and text can be highlighted on the screen for underline, boldface, or italics. This program can also be used with *Data Manager 128*, *Swiftcalc 128*, and other Sylvia Porter Series programs, all from Timeworks.

Publishers' Names and Addresses

Abacus
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Berkeley Softworks
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What Is a Robot?

Fred D'Ignazio
Contributing Editor

We all have our heroes. Mine is Isaac Asimov. He's been my hero ever since I got hooked on his swashbuckling space adventure books, as a nine-year-old back in the fifties.

I love Asimov for all his accomplishments, but he is my hero most of all because of his robot books, including *I, Robot* and the robot novels (featuring the detective Lije Bailey and the robot R. Daneel Olivaw). Asimov coined the word *robotics* and devised the now-famous Three Laws of Robotics.

The First Law: "A robot may not injure a human being or, through inaction, allow a human being to come to harm." The Second Law: "A robot must obey the orders given it by human beings except where such orders would conflict with the First Law." The Third Law: "A robot must protect its own existence, as long as such protection does not conflict with the First or Second Law." In recent books, his robots have themselves concocted a new, Zeroth Law: "A robot may not injure humanity or, through inaction, allow humanity to come to harm."

It Must Resemble a Person

In his recent Foundation novels, *Foundation's Edge* and *Foundation and Earth*, Asimov identifies robots as machines which resemble human beings. This is upsetting news! Here we have the father of robotics telling us that to qualify as a "robot," a machine has to resemble a human being.

Asimov's prescription flies in the face of the thinking and writing I have been doing for the last 20 years and ignores the millions of nonhumanoid robots hurtling through outer space, exploring the ocean's floor, and assembling, welding, and painting cars in factories.

In my 1982 book, *Working Robots*, I examined robots in fact and fiction and came up with a definition for a "real" robot: *A real, working robot must be under computer control, and it must have sensors.* The computer control makes the robot programmable and independent of direct human joystick-type manipulation. The sensors give the robot an awareness of the outside world and the ability to feed sensory data to its program for a decision on new actions to take.

An Age-Old Fascination

Asimov and I do agree on one subject: Robots fascinate people. This has been true for thousands of years—at least since 200 B.C., when Heron of Alexandria created automated theaters complete with exploding flames, metallic dancers, and whirling gods.

Even further back in time, Aristotle wrote: "If every instrument could accomplish its own work, obeying or anticipating the will of others, . . . if the shuttle could weave, and the pick touch the lyre, without a hand to guide them, chief workmen would not need servants, nor masters slaves."

What is it about robots that makes them so bewitching? Asimov might answer that it is their human-like form. When we see robots, we are like Narcissus gazing into a high-tech mirror and seeing our own shape in its reflection. We use magic, cleverness, and craft (as in Collodi's *Pinocchio*) or the tools of science (as in Shelley's *Frankenstein*) to make a being in our own image.

Strong Attraction

I think that creating an artificial human is a powerful part of the attraction that robots hold for us. For example, creating a robot beaver wouldn't be nearly as satisfying as creating a robot person.

But I think even more important is the ability to give life where none exists. Shape is secondary to the godlike power of making a being come alive. In my book *Robot Odyssey* (Tor, 1988), the hero, Homer, debates this subject with his companion, Checkers, who offers a robot's perspective on the matter:

> "Humans' fascination for robots runs very deep into the past and deep into the human imagination—ever since you saw the grasses wave in the wind and from that motion imagined that a living hand was brushing those grasses. Your fascination is not with robots themselves, of course, but with what they symbolize."
>
> "What *do* they symbolize?" asked Homer.
>
> "Creating life, existence, and being," said Checkers. "It is still a mystery to you humans that you are alive at all. So it is utterly bewitching for you to think about another being, though not a human, who is also alive. That's why animals—pets—charm you and delight you. And when your technology became so advanced, you became fascinated with lifelike machines."

What Do *You* Think?

All this discussion causes me to turn to you, my readers, and ask: What is a robot? Is it a machine that resembles a human being? Is it a computer-controlled machine with sensors? Is it a machine that is "alive"?

What do *you* think?

Write to me, in care of *COMPUTE!'s Gazette*, 324 West Wendover Avenue, Suite 200, Greensboro, NC 27408.

A Pirate Tells All

Rhett Anderson
Assistant Editor

Piracy. It's a big issue. Anyone who doubts that can just ask our readers. Ever since Todd Heimarck wrote "The Software Police" for the May 1988 "Horizons," we've received letter after letter about this complex issue. In June, we published two full pages of letters from pirates, anti-pirates, people angry at software companies, and people angry at us.

But that didn't stop the flood of letters. In fact, although they've slowed to a trickle (a few a week), they still come in. Many of you wrote about your opinions with great eloquence. We appreciate your letters.

One letter in particular stood out, though. It's a letter from a pirate in Illinois. I'm going to let him have (just about) the last word on piracy, mostly because the letter brings up some interesting points about the computer industry. Note that I've edited the letter slightly to make it fit here.

I've had my trusty 64 ever since it came out and so I have a library of over 7,000 games, 50% of which aren't even being sold on the market.

And you guys wonder why we pirate. Let me tell you.

1. Pirates can get games years before they are released.
2. Our games are usually cracked, so we can distribute or copy without a nibbler or anything, by hand if we want.
3. Some of our games have intros that are better than the game itself! Plus, most cracking groups add features to the games, so you can skip levels, play with unlimited lives, and more. The game ends up better.
4. We get great games that are from all countries. Some of them will never come out on the market. If we don't pirate, how are we supposed to get them?

So why can't the stores and other places come out with the stuff we get when we get it? Example: I have *OUT-RUN* and *Super Mario Bros.* for the 64. I've had them for about a year and a half now. You guys will have to wait a long time, if ever, to get them.

I had *Paperboy* two years before it came out, and it just came out two months ago. Give me a break! How lame do you think we are? If I see a game come up on a bulletin board, I'm gonna get it.

Another thing is that some companies do lame versions of great arcade games. It makes the 64 look bad. I saw a version of *Kid Nikki* that made me cry. I've seen better public domain games. But there are European versions that are better. If the 64 version looks bad next to a Nintendo version, Commodore can lose sales like that. But only the pirates know how good the 64 is, see what I mean?

Please keep this pirate/debate thing going in Horizons. I'll keep buying this magazine and will notify my friends of it cuz you're about the only mag that has really covered this subject a lot.

The Silver Lining

Whatever you may think of him, this guy's not all bad. He shows genuine loyalties to his friends in the cracking clubs. He's upset by the inroads the Nintendo has made at the expense of the more versatile 64. He loves his computer, so he collects thousands and thousands of examples of what it can do.

Let's look at his four points, one at a time.

Pirates can get games years before they are released. That is sometimes true. After all, it takes a long time to write a good program. Early versions often mysteriously find their way into the hands of pirates. Good games spread like wildfire across bulletin boards.

It takes a long time to write the documentation for a program. It takes a long time to test a program. It takes a long time to decide how to advertise and market a program. It's no wonder pirates have a head start. Of course, they also often have buggy versions of the program.

Publishers of software should pay attention to what our pirate is saying. Make sure that early copies of your programs don't find their way out of the office. Try to cut down on the time that a program spends in "no man's land"—that time after the game is finished but before it has been released.

Our games are usually cracked, so we can distribute or copy without a nibbler or anything, by hand if we want. This is a cry against copy-protection. It's natural for pirates to want to get rid of copy-protection, but it's also natural for nonpirates to do away with it. Publishers: No one likes copy-protected disks. If your manual is long enough not to be duplicated by the casual copier, try keyword protection. Otherwise, try a coded wheel or slide.

Some of our games have intros that are better than the game itself! Plus, most cracking groups put added features in the games, so you can skip levels, play with unlimited lives, and more. The game ends up better. Apparently, some pirates are doing a lot of work. Pirates: Put your talents into more constructive pursuits. You can make hundreds of dollars by selling a single program to us. You can make thousands if your work is good enough to be distributed by commercial software houses (most of which will happily review unsolicited software).

We get great games that are from all countries. Some of them will never come out on the market. If we don't pirate, how are we supposed to get them? I don't know.

Next Month:
Readers Make Faces

the programmer's page

Notebooks and POKEs

Randy Thompson
Contributing Editor

"The Programmer's Page" is interested in your programming tips and tricks. Send all submissions to The Programmer's Page, **COMPUTE!'s Gazette,** *P.O. Box 5406, Greensboro, North Carolina 27403. We'll pay $25–$50 for each tip we publish.*

One of the best programming tools you can have is a notebook crammed with such things as ASCII charts, keycode values, small subroutines, and other hacking hints and tidbits. If you don't have a programming notebook, consider making one. Your programming notebook may very well become the most-referenced computer manual that you own.

What should you put in your notebook? Tips from "The Programmer's Page" or "Reader's Feedback," for one thing. Anytime you find something in a book or magazine that you refer to often, make a photocopy of it and put it in your notebook.

Charts and Tables

Every programming notebook should have an ASCII chart. One of the best ASCII charts available is in the January 1985 issue of *COMPUTE!'s Gazette,* pages 120–122. This chart is more than just a table of ASCII codes; it's a complete cross-referenced guide to BASIC tokens, 6502 instructions, screen codes, and hexadecimal/decimal numbers.

Screen and color memory maps can be an invaluable addition to your notebook. You can find good screen and color memory maps in Appendix D of the *Commodore 64 Programmer's Reference Guide.* In fact, most of the Appendices found in Commodore's programmer's reference guides provide quality notebook material.

Another great source of charts and tables aimed specifically at Commodore computers is *The Complete Commodore Inner Space Anthology,* available from The Transactor, a Canadian publishing company. This book has charts and tables that cover everything from the PET to the ill-fated Plus/4.

Keep your notebook stocked with graph paper, too. Graph paper is useful for designing sprites and character sets, as well as for laying out screen displays and printer output. It's also fun for doodling.

64 POKEs

An important addition to any programmer's notebook is a list of useful POKEs. Unlike most computers, the Commodore 64's operating system is very accessible and easy to play around with. With a single POKE statement, you can alter the way the computer works. In the accompanying tables, you'll find a few POKEs for the 64 that you should find useful.

Be careful when entering these POKE commands. Although you can never damage your computer with a POKE, you can lock up the computer, forcing you to turn your 64 off and back on again to regain control.

Many of these POKEs were sent in by Victor J. Fogh of Mariposa, California. Others were taken from the COMPUTE! book, *Mapping the 64*—another great source of notebook material. The rest are the result of experience and experimentation. If I've neglected to mention any of your favorite POKEs, let me know—chances are they'll appear in a future column.

Characters and the Screen

POKE 53272,21	switch to uppercase mode
POKE 53272,23	switch to lowercase mode
POKE 53280,C	change border color (C=0–15)
POKE 53281,C	change screen color (C=0–15)
POKE 646,C	change cursor color (C=0–15)
POKE 53265,PEEK(53265) AND 23	turn off screen display
POKE 53265,PEEK(53265) OR 16	turn on screen display

The Keyboard

POKE 650,128	all keys repeat
POKE 650,127	no keys repeat
POKE 650,0	normal repeat
POKE 657,128	disable SHIFT-Commodore
POKE 657,0	enable SHIFT-Commodore
POKE 198,0	clear keyboard buffer
POKE 649,1	disable keyboard buffering
POKE 649,0	disable keyboard
POKE 649,10	normal buffering
POKE 808,239	disable RUN/STOP key
POKE 792,193	disable RESTORE
POKE 808,239:POKE 792,193	disable RUN/STOP-RESTORE
POKE 808,234	disable RUN/STOP-RESTORE and LIST
POKE 808,237:POKE 792,71	enable RUN/STOP-RESTORE and LIST

Miscellaneous

POKE 775,200	disable LIST
POKE 775,167	enable LIST
POKE 56341,S	set cursor speed (S=0–255)
POKE 204,0	turn cursor on during a GET
POKE 204,255	turn cursor back off
POKE 19,65	turn off question mark during INPUT
POKE 19,0	turn question mark back on
POKE 54296,15:POKE 54296,0	make a click sound

BASIC for beginners

Variables Revisited

Larry Cotton

"BASIC for Beginners" begins its third year this month. New readers and old should benefit from this month's review of constants and variables, and the many ways in which they can be used.

Constants

A constant is a number, letter, word, phrase, sentence, symbol, or series of symbols which *does not change* while a BASIC program is running. These numbers, words, or symbols may be as small as one character or (in the case of words or symbols) as large as 255 characters. Constants may be *numeric*—representing numbers—or *string*—representing letters or symbols. Here are some examples shown in program lines:

```
10 X=4                    (numeric)
20 Y%=2077                (numeric)
30 R5=12.44               (numeric)
40 W$="THESAURUS"         (string)
50 CAR$="FERRARI"         (string)
60 N$="1456"              (string)
```

The constant Y% shown in line 20 is called an *integer* numeric constant; the other numeric constants are *floating point*. Line 60 shows a tricky situation. Even though N$ looks like a numeric constant, it's really a string, because its value is inside quotation marks. No mathematical operations can be performed on it.

Constants are usually assigned values near the beginning of BASIC programs. The name of the constant always appears first; then comes an equal sign; last is the value of the constant.

Variables

Variables are exactly like constants, except that their values can change while a BASIC program is running. What makes them change? Numeric variables, such as X, Y, or R5, may be changed by performing mathematical operations on them. And string variables, such as W$ or SY$ or CAR$, may be changed by being made longer (concatenated). Look at this example:

```
10 A=10
20 A=A+5
30 PHRASE$="TERRIFIC"
40 PHRASE$=PHRASE$+" PEOPLE"
50 PRINT A;PHRASE$
```

Line 20 changes A from 10 to 15, and PHRASE$ changes from TERRIFIC to TERRIFIC PEOPLE in line 30. When they change, the old values for A and PHRASE$ are lost. If you want to retain a variable's old value, that value must be stored in another variable before any changes are made. For instance:

```
10 A=10
20 OLDA=A
30 A=A+5
40 PHRASE$="TERRIFIC"
50 OLDPHRASE$=PHRASE$
60 PHRASE$=PHRASE$+" PEOPLE"
70 PRINT OLDA
80 PRINT A
90 PRINT OLDPHRASE$
100 PRINT PHRASE$
```

A and PHRASE$ are defined in lines 10 and 40; their values change in lines 30 and 60 from 10 to 15 and from TERRIFIC to TERRIFIC PEOPLE, respectively. Since we wanted to remember their old values, more variables (in this case, OLDA and OLDPHRASE$) were used in lines 20 and 50 to preserve A's and OLDPHRASE$'s old values.

Arrays

Arrays are a group of related constants or variables that are identified by subscripts in parentheses. They can be numeric or string. Here are some examples:

```
10 CAR$(1)="FERRARI"
20 CAR$(2)="BMW"
30 CAR$(3)="MASERATI"
40 NUMBER(1)=4256
50 NUMBER(2)=5.145
60 NUMBER(3)=256
```

Two Forms

As mentioned above, numeric constants and variables can be in two forms, integer or floating point. Integers are identified by a percent sign (%) attached to the variable name. Their values can range from −32768 to +32767 (whole numbers only). The following are a few examples:

```
10 A%=23
20 B%=0
30 C%=-456
```

Floating-point numeric variables can (but don't necessarily have to) contain a decimal. They are BASIC'S most common type of numeric variable. Here are some examples:

```
10 X=45.23
20 Y=.345
30 Z=56
```

Note that the value for Z, even though it contains no decimal, is a floating-point constant, because it's stored in a floating-point variable, a variable not identified by a % sign.

Floating-point numeric variables consume much more memory than integer numeric variables, so if memory is a problem, use the latter.

Naming Constants and Variables

When deciding on names for variables consider these hints:

- Use meaningful names or abbreviations. Variables can be either one letter, two or more letters, or a combination of a letter and number. Examples of valid variable names are K, K$, K6, K6$, KI, KI$, KITE, and KITE$.

The number can't come first in a variable's name—6K and 6K$ won't work. Recall that Commodore computers use only the first two characters of a variable's name. Thus KI, KITE, and KIWI are all the same to the computer.

- Don't use reserved words (keywords) for variable names. They cannot even be embedded in variable names. A complete list of keywords for your computer can be

found in your programmer's reference guide or user's guide. In addition to all the words in BASIC, certain variables, such as ST, TI, and TI$, are reserved. Here are some example of invalid variable names:

TOTAL=678 (contains *TO*)
CONDO=110000 (contains *ON*)
NOTHING$="ZERO" (contains *NOT*)
FIRST=200 (contains *ST*)
SSSSSSSIF$="COST" (contains *IF*)
TINT$="MAUVE" (contains *INT*)
WORD$="SPLINTER" (contains *OR*)
INSTANT$="SECOND" (contains *TAN*; *ST* is OK to use in a string variable name)

The problem with the last three examples is only in the variable's names, not their values. The names contain keywords (*INT, OR,* and *TAN*). Note that it's fine for keywords to be inside quotation marks (*INT* in *"splinter", ON* in *"second,"* and *COS* in *"cost"*).

As a final exercise this month, here's a little program that shows what you can do with constants which represent a series of symbols.

```
KC 5 REM COPYRIGHT 1988 COMPUT
     E! PUBLICATIONS, INC. - A
     LL RIGHTS RESERVED.
DG 10 T1=16:T2=12:T3=18
HK 20 FORCOUNT=1TO2:READFACE$(
     COUNT):NEXT
MD 30 FORCOUNT=1TO4:READEYE$(C
     OUNT):NEXT
DR 40 PRINT"{CLR}{7 DOWN}
JQ 50 FORCOUNT=1TO2:PRINTTAB(T
     1)FACE$(COUNT):NEXT
HK 60 PRINTTAB(T2)"{3 DOWN}PRE
     SS SPACE BAR{9 UP}
PH 70 FORCOUNT=1TO4:PRINTTAB(T
     3)EYE$(COUNT)"{UP}
XB 80 GETK$:IFK$=""THEN80
XX 90 NEXT:GOTO70
AK 100 DATA" UUUUU {DOWN}
       {7 LEFT}N£5 Y£M{DOWN}
       {7 LEFT}£H£ £P£ £P£ £N£
       {DOWN}{8 LEFT}U£H£
       {5 SPACES}£N£I
MC 110 DATA"{LEFT}J£H£
       {2 SPACES}Z{2 SPACES}
       £N£K {DOWN}{9 LEFT}M J*
       K N{DOWN}{6 LEFT}M£3 P£
       N {DOWN}{5 LEFT}B G
KM 120 DATA"£C£ £C£
MG 130 DATA"£D£ £D£
RM 140 DATA"£F£ £F£
FS 150 DATA"£V£ £V£
```

Line 10 sets up three constants, T1–T3, for use in TAB statements (see lines 50–70). Lines 20 and 30 read data into two subscripted arrays. FACE$(1) and FACE$(2) become a series of symbols that will draw a cartoon character's face, minus eyes. EYE$(1) through EYE$(4) become the eyes, which will be drawn, sequentially, in four positions.

Line 40 clears the screen and moves the cursor down seven spaces. Line 50 prints the face by incrementing a FOR–NEXT loop twice. Note the TAB statement, which ensures the face is centered horizontally.

Line 60 moves the cursor down three spaces, prints a message, and returns the cursor to the proper position for drawing the eyes.

Line 70 contains a FOR–NEXT loop which prints the first symbolic representation of eyes—EYE$(1). Before we encounter a NEXT, there's a GET statement in line 80 waiting for a key to be pressed. The program loops at line 80 until that happens, which sends control on to line 90, where the NEXT resides.

Line 70 becomes active again, which prints EYE$(2)—the next symbolic representation of eyes. The eyes are in a slightly different position, thus giving the illusion of motion.

This loop progresses until COUNT becomes 4 and all four eye positions have been printed. The loop ends, only to encounter a GOTO70, which starts the whole process over again.

Lines 100–110 are DATA statements that contain the symbols to draw the face plus symbols to move the cursor down and left. Lines 120–150 contain the data for the eye symbols.

Make it a practice to use constants and variables to define numbers, words, phrases, or a series of symbols that will be used repeatedly in your program. Not only will you save typing and conserve computer memory space, but your BASIC programs will run much faster.

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machine language programming

Kernal Keys

Jim Butterfield
Contributing Editor

The Kernal is the operating system of Commodore 8-bit computers. Your programming tasks can be made much simpler if you take advantage of the many tested and debugged Kernal routines. Two common routines are GETIN ($FFE4) and INPUT ($FFCF).

When you use GETIN to get characters from the keyboard buffer, the character is returned in the accumulator. It does not echo the characters to the screen; your program will need to do that job. GETIN never waits for input. If the keyboard buffer is empty, the routine returns immediately with a 0 in the accumulator.

INPUT gets characters from the screen instead of the keyboard buffer. When you first call INPUT, the Commodore screen handler takes over. The cursor flashes, and the user is free to edit the screen as desired—possibly even clearing the screen and changing colors.

When RETURN is pressed, the INPUT routine returns with the first character that was entered. Subsequent calls to INPUT yield more characters from the screen. When a RETURN character is found, there is no more data for this INPUT cycle.

By the way, a call to PRINT cancels the rest of an INPUT line. This can be useful if your program decides it does not need to get the remainder of a screen line.

Complete Control

Machine language programmers tend to favor GETIN. It leaves them completely in control. Programmers have to do character echoing, cursor flashing, deletion, and cursor movement on their own.

INPUT is simpler to use, but its main advantage is that it allows "default prompts"—if the user just presses RETURN, these characters will be input from the screen. INPUT is not disturbed by the special characters (the colon and the comma) that disrupt BASIC's INPUT statement.

This month's program uses both INPUT and GETIN. Type it in using an assembler or machine language monitor.

In the program, INPUT is used to get a line of text. GETIN is used to receive a single-digit number. To save typing, the prompts for each are very brief. When the program asks T?, type in any line of text and press RETURN. Next the program will ask N?, inviting you to press any key from 1 to 9. Note that the cursor does *not* flash here.

The program starts at address $2000 (8192 decimal). That's not the optimum place for a machine language program, but it does allow this demonstration to run on any Commodore 8-bit machine:

```
2000  LDX  #$00     ; Prompt Loop 1:
2002  LDA  $205C,X
      JSR  $FFD2
      INX
      CMP  #$20
      BNE  $2002
```

The first prompt is stored at $205C. I've used the space character to detect the end of the prompt. We'll do this again for the other prompt.

```
      LDX  #$00
      STX  $2100
```

The X register, and location 2100, are used to store the position of the characters we will take from the screen and store. Here's the call to INPUT:

```
2012  JSR  $FFCF    ; (INPUT)
      LDX  $2100    ; (restore X)
      STA  $2101,X
      INX
      STX  $2100
      CMP  #$0D     ; (RETURN?)
      BNE  $2012
```

As each character is received, it's checked for a RETURN, which signals end-of-line. Until we find it, we put the characters away and loop back. When we find a RETURN, we move to a new screen line:

```
      LDA  #$0D
      JSR  $FFD2
```

Here comes the second prompt, stored at $205F; coding is the same as above:

```
      LDX  #$00
202A  LDA  $205F,X
      JSR  $FFD2
      INX
      CMP  #$20
      BNE  $202A
```

Now GETIN ($FFE4) reads the keyboard. If the character is not in the range from 1 to 9 ASCII, we loop back and wait:

```
2035  JSR  $FFE4
      CMP  #$31     (ASCII 1)
      BCC  $2035
      CMP  #$3A     (ASCII 9, plus 1)
      BCS  $2035
```

When we pass this point, we have received an ASCII character in the range of 1 to 9. We echo it to the screen. Then we strip it down to a binary number and transfer the binary value to the Y register, where it will be used. Now we print a RETURN:

```
      JSR  $FFD2
      AND  #$0F
      TAY
      LDA  #$0D     ; (RETURN)
      JSR  $FFD2
204B  LDX  #$00
```

Here's where we print the line we input previously. This loop prints each character of the line. We detect end-of-line by spotting the RETURN character:

```
204D  LDA  $2101,X
      JSR  $FFD2
      INX
      CMP  #$0D     ; (RETURN?)
      BNE  $204D
      DEY           ; (count lines)
      BNE  $204B
      RTS
```

These are ASCII characters:

```
205C  54  3F  20  (T, ?, SPACE)
205F  4E  3F  20  (N, ?, SPACE)
```

Font Grabber

Mystic Jim

"Font Grabber" turns your favorite Commodore character sets into GEOS fonts. A font-identification changer is also included. For the 64 and 128.

Like a Macintosh or an Amiga, a Commodore 64 or 128 equipped with GEOS is a master at handling fonts. With *geoWrite* or *geoPaint*, you can use fonts of varying point sizes, widths, and styles. GEOS comes with several fonts, and Berkeley Softworks offers even more, but "Font Grabber" lets you tap into one of the largest selections of fonts in the computer world—Commodore character sets.

The Commodore 64 uses an 8 × 8 character cell to specify characters. The character set is fully redefinable. Over the years, hundreds of alternative character sets have been designed. In fact, many *GAZETTE* readers have designed their own fonts with "Ultrafont+", a powerful utility from the September 1986 issue of *GAZETTE*. Now you can use any of those fonts with GEOS.

Getting Started

Program 1 is Font Grabber. To ensure accurate entry, type it in using "The Automatic Proofreader," found elsewhere in this issue. When you've finished typing, be sure to save a copy of the program to disk.

Program 2 is "GEOS Font ID Editor." This program lets you change the ID number of any GEOS font. This is helpful if you have two fonts with the same ID number.

Before you start converting character sets to GEOS fonts, you'll need a few character sets. You might be able to download them from an information service such as CompuServe or Q-Link. If you want to design your own, use a character-set editor like Ultrafont+.

Font Grabber writes directly to GEOS disks. For that reason, you should always make a backup copy of your disks, just in case anything goes wrong. First, make a GEOS work disk (instructions for doing this are in your GEOS manual). Now copy the GEOS font called "Commodore" onto the work disk. From the deskTop, rename the Commodore font to <SWAP>. Be sure to use uppercase letters. (You must create the <SWAP> file each time you wish to convert a font.)

When you're ready to convert a font, boot up your 64 (or your 128, in 64 mode). Do *not* boot GEOS. Font Grabber is a BASIC program that operates in the standard 64 environment.

From Disk or RAM

If you'd like to translate a character set that is currently displayed, follow the instructions below. Note that Font Grabber will translate any character set (no matter where it is located in memory) as long as it is being used.

- Load and run Font Grabber.
- When asked for the source of the set, choose memory.
- Choose the character-set type (uppercase/graphics, or lowercase/uppercase).
- Enter the name of the GEOS font you are creating.
- When prompted, insert the destination disk (the GEOS work disk that you created earlier).

If you'd like to translate a character set from a disk file, follow these instructions:

- Load and run Font Grabber.
- When asked for the source of the character set, choose disk file.
- Place the source disk (the one with the character-set file) into the drive; then press RETURN.
- The directory is displayed; when you see the character set you want to convert, hit a key.
- Move the cursor to the character set's name and press RETURN.
- When prompted, insert the GEOS work disk that you prepared earlier.

When Font Grabber finishes, your Commodore character set has been converted to a GEOS font. This font can be italicized, reversed, outlined, or made bold just like any other GEOS font.

After the font has been converted, you're asked whether you'd like to return to BASIC or boot GEOS. If you choose to boot GEOS, insert a GEOS boot disk into the drive and press RETURN.

What's in a Name?

Once in a while, you may find that you have two GEOS fonts with the same ID number. GEOS won't let you use like-numbered fonts together. To solve the problem, use Program 2, "Font ID Changer."

Like Font Grabber, Font ID Changer is a BASIC program; it can be used only from within the standard 64 environment.

To use the program, load it and type RUN. You'll be asked to put a disk in the drive. Insert the disk that holds the font you'd like to renumber. When you see the font you want to change, press a key. Move the cursor up to the correct font; then press RETURN. Font ID Changer shows the current ID number of the font. If you choose to change the font's number, enter the new number when prompted.

See program listings on page 96.

Next Month:

Clever Tricks and Handy Hints for *geoPaint* Users

EASY LOADIR

Here's a must-have utility for every disk drive owner. Load the directory with two keystrokes—then just move the cursor over a filename and press RETURN to load the program. For the 64 with a disk drive.

Randy Thompson

"Easy LoaDIR" is designed to make programs both easy to find and easy to load. With only two keypresses, you can list a disk's directory without disrupting the BASIC program in memory. You can also freeze the listing or stop it completely. So, what makes this directory lister different from all the others? By moving the cursor on top of a filename and pressing RETURN, you can load any program on the disk.

◆Typing It In

Easy LoaDIR is a machine language program in the form of a BASIC loader. Since it requires accurate typing, use "The Automatic Proofreader," found elsewhere in this issue, when you're entering the program. Be sure to save a copy to disk when you've finished typing.

To get started, load and run Easy LoaDIR. First, Easy LoaDIR installs itself; then it prints a message at the top of the screen to inform you that it's ready to use. Type NEW to erase the BASIC loader from memory.

With Easy LoaDIR, getting a disk directory is easy. Simply type $ and press RETURN. The directory of the disk in drive 8 lists to the screen. To freeze the listing, press the space bar. Pressing any key continues the listing. To halt the directory as it's listing, press RUN/STOP.

If you wish to list the directory of the disk in drive 9, enter $9. Similarly, $8 can be used to list the directory of the disk in drive 8. The device number following the $ may be a constant, a variable, or even an expression such as $4*2+N. If a value other than 8 or 9 is entered after the $, Easy LoaDIR returns an ILLEGAL QUANTITY ERROR. Also, if you try to get a directory of a drive that isn't present, you'll get an ILLEGAL QUANTITY ERROR.

◆Easy Loading

Once you get a directory, loading programs is easy. Use the cursor keys to move the cursor onto the filename of the desired program. Press RETURN. It's that easy.

Remember: Easy LoaDIR only *loads* programs listed in the directory. You still have to enter the appropriate RUN or SYS command needed to execute the program.

If a disk's directory is very long, the filename of the program that you wish to load may scroll off the screen before the directory has finished listing. If this is the case, simply press RUN/STOP while the program's filename is still on the screen. The directory listing halts, allowing you to cursor up, press RETURN, and load the program.

◆More Benefits

As noted, the $ command by itself defaults to listing the directory of drive 8. You can change the default drive to drive 9 by typing POKE 52803,9 after you've run the BASIC loader. A POKE 52803,8 resets the default back to drive 8. By changing the 8 to a 9 in line 210 of the BASIC loader, you can make drive 9 the permanent default drive.

You can use Easy LoaDIR's $ command from within a BASIC program to list disk directories. Easy LoaDIR does not disturb BASIC and is compatible with most programming utilities and fast loaders, including "TurboDisk" (July, 1985).

Easy LoaDIR is fairly foolproof. It can't be disabled by the RUN/STOP–RESTORE key combination. If it ever does become disabled, type SYS 52736 to reenable it.

See program listing on page 98.

Sprite Killer

James Host

Set new world records on your favorite arcade game or add a pause feature to any program with this super utility for the 64.

Playing computer games is an exciting adventure—outwitting the goblins and grabbing the gold, keeping on the run and out of reach, using dexterity and quick thinking. If you want to rack up higher scores and get to new levels you might never see otherwise, try "Sprite Killer."

Sprite Killer can be used to turn off any sprites you like, for any reason. It can also be used to pause games and other programs that don't have a built-in pause feature.

Zapping Sprites

Sprite Killer is written entirely in machine language, so you'll need to use "MLX," the machine language entry program found elsewhere in this issue, to type it in. When MLX prompts you, respond with the values given below.

Starting address: 0801
Ending address: 0C18

Be sure to save a copy to disk or tape before you exit MLX.

Sprite Killer loads and runs just like a BASIC program. When you type RUN, Sprite Killer relocates itself so that it will be out of the way of most programs. Now load and run your favorite game as usual. When you want to turn off a sprite, tap the RESTORE key (do not hold down the fire button or any key while doing this). You'll see the Sprite Killer menu. All currently active sprites are displayed at the top of the screen. Beneath them are numbers ranging from 0 to 7. These numbers correspond to the eight hardware sprites used by the 64.

Zap sprites with this utility. Here, the sprites from "Quolerus" are displayed. Turn off your enemies for high scores.

To disable a sprite, just press its associated number on your keyboard. The sprite vanishes from the screen. You may disable as many as you wish.

When you've finished disabling sprites, return to your game by pressing the RETURN key. Imagine—you can pick up the dots in maze games without any monsters chasing you!

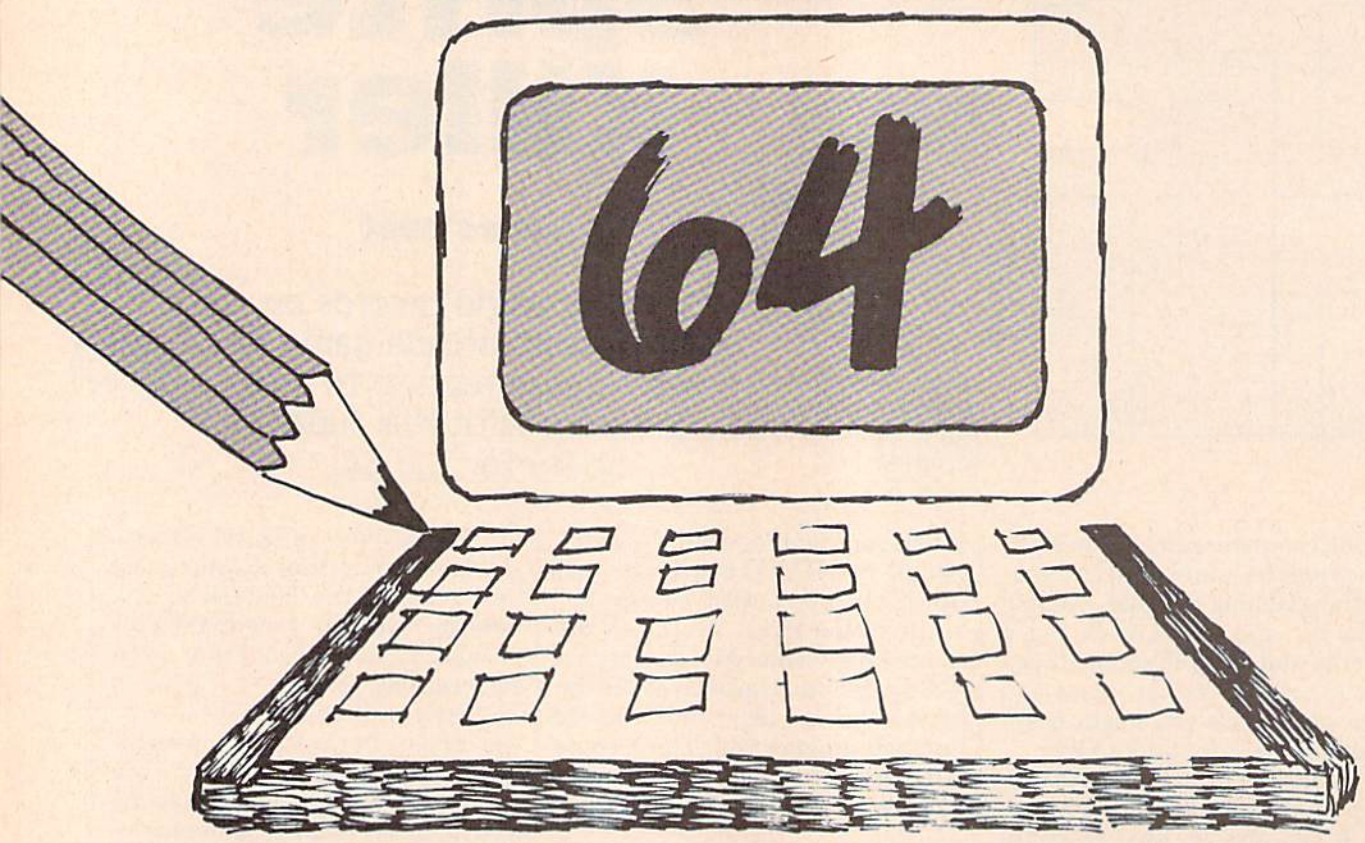
Sprite Killer can also be used as a pause feature, even when the program you want to stop doesn't use sprites. To pause a program, tap the RESTORE key to bring up the sprite-disabling menu. Press SHIFT LOCK and then RETURN. Your program's screen reappears, but the program remains paused until you release the SHIFT LOCK key.

Technical Notes

Sprite Killer occupies RAM in the $CF00–$CFFF area of memory, out of the way of most programs. It also uses all of the RAM hidden by the I/O block. Sprite Killer wedges into the operating system and BASIC through several page 3 vectors. It isn't disabled by hitting RUN/STOP–RESTORE. The program is most effective when used with those games which check location 53278 (SPSPCL—the sprite-to-sprite–collision register) to see which sprites have collided.

See program listing on page 89.

NOTEPAD



Basil Cox

Now there's a better way to make notes. Put them where you can find them in a flash—in your Commodore 64's memory or on a disk. You can start writing by simply touching a key—even with a BASIC program in memory.

Do you keep a notepad beside your computer? Perhaps you use it to jot down some crucial memory addresses, an important reminder, or a list of variables for your new program. Or maybe you need a way to keep a list of telephone numbers or a bowling schedule. Now you can jot it all down a quick and easy way.

"Notepad 64" turns your computer into a notepad. You can stash notes in memory or on a disk. Do anything with Notepad that you do with an ordinary scratch pad—you'll appreciate its added speed and convenience.

Typing It In

Notepad 64 is written entirely in machine language for speed and versatility. Type it in with the "MLX" machine language entry program found elsewhere in this issue. The MLX prompts, and the values you should type in, are as follows:

Starting address: C000
Ending address: C397

When you've finished typing in all the data, be sure to save a copy to tape or disk before leaving MLX.

To load the program, type LOAD *"filename"*,8,1 (tape users should type LOAD *"filename"*,1,1).

When the program has loaded, type NEW and press RETURN. Then type SYS 49152 to install it.

Keeping Notes

Notepad has scores of uses. Suppose, for instance, that you created a different Notepad disk file named

for every day of the week. Such a set of files could act as a personal calendar, where you could post such notes as *Take Fido to the vet at 3*. You could easily keep yourself posted a week ahead on upcoming appointments. No doubt you can think of many other creative uses.

Notepad does not use any of BASIC's memory, so you can keep a BASIC program in memory and even run it while keeping Notepad and your notes undisturbed. To activate the program at any time, press the back-arrow key (←), then RETURN. Notepad will be activated even if a BASIC program is currently running. (Note that if you enter Notepad while a BASIC program is running, the BASIC program will stop.)

When you enter Notepad, you're presented with a menu of five options:

View Notes. This allows you to read a note already in memory. When you have finished reading it, press any key to return to the menu.

Enter Notes. You can write a note up to one full screen in length—that's a thousand characters. All editing keys function normally. This includes CLR/HOME, which erases the screen with a keypress. Don't cursor below the bottom of the screen, or the screen will scroll up, and anything written at the top will be lost. To return to the menu, press the back-arrow key (←).

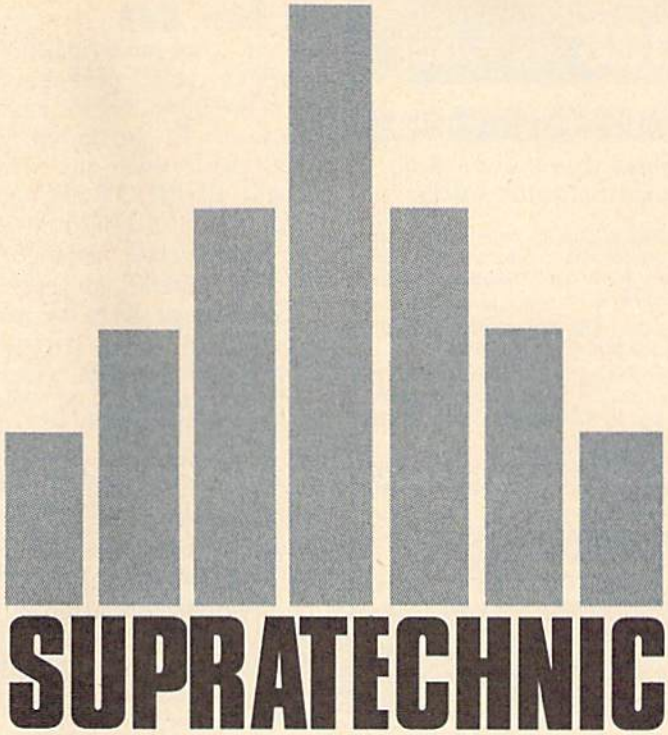
Save Notes. The program prompts you for a filename, then saves the current note to disk. Be sure to enter a name unused on the disk, or the file won't be saved. Note that the program doesn't alert you if the file already exists on the disk—a blinking drive-error light is the only indication.

Load Notes. The program will prompt you for a filename. If the file doesn't exist on the disk, the drive-error light will blink.

Exit. Returns to BASIC, where you'll find any program in memory intact.

You can change the screen colors by pressing *B* for border, *S* for screen, or *C* for character color. These color settings remain in effect until you turn off the computer.

See program listing on page 89.



Jeff Litz

Take the 64's video chip beyond its natural limits with this powerful machine language program. A demo program is included to show you how to use full-screen graphics in your own programs. A disk drive is required.

A few years ago something startling happened. Programmers found that they could trick the 64's VIC-II chip into displaying graphics in an area previously considered off-limits: the screen borders. In the September 1987 *GAZETTE*, J. Kelly presented "Impossible Scroll," a program that scrolled text in the border area of the screen.

"Supratechnic" goes further, allowing you to display sprites above or below the normal border of the screen *and* to partially bitmap these areas with a pattern of your choice.

Typing It In

Program 1 is the main program. It is written entirely in machine language, so you'll need to use "MLX," the machine language entry program found elsewhere in this issue, when you type it in. When you run MLX, you're prompted for the starting and ending addresses for the data that you'll be entering. For Supratechnic, respond with the values indicated.

Starting address: 0801
Ending address: 0B00

When you've finished typing, be sure to save a copy to disk. Use the name "SUPRATECHNIC"—Program 3 expects a file of this name.

To get an idea of what Supratechnic is capable of, you'll need to enter Program 2, Supratechnic Demo. The program is written in BASIC. Type it in carefully and save it with the name "SUPRA.DEMO".

Program 3 is used to load and run both Supratechnic and the demo. Type it in and save it to disk with the name "SUPRA.BOOT".

To see Supratechnic in action, type LOAD "SUPRA.BOOT",8. After the program has finished loading, type RUN. If you like graphics demos, you'll love the Supratechnic demo.

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On Your Own

On the other hand, if you're a programmer, you'll probably want to try to use Supratechnic in your own programs. To get started, load Supratechnic with the statement LOAD"SUPRATECHNIC",8,1. Then type SYS 2061 to execute it.

Supratechnic moves BASIC up to 3584 ($0E00) and performs a NEW. This protects the main program from being corrupted by BASIC and allocates space for the graphics buffer. *Note:* Whenever RUN/STOP-RESTORE is used, the program is disengaged. You must type SYS 2083 to reengage it without erasing the current BASIC program. If you wish to disengage the program, type SYS 2086.

Supratechnic's first function is mode changing. To do this, type POKE 251,*n*, where *n* is the mode number. The following list describes the modes:

0 Normal video mode.

1 Sprite mode. Allows you to display sprites in the top and bottom border areas.

2 Graphics mode. Lets you partially bitmap the border and screen. Normally, each pixel can be specified independently in bitmapped graphics modes. Supratechnic's partial bitmapping allows you to specify a pattern for each video scan line. The pattern is specified with a byte value that is repeated 40 times across the line.

Supratechnic's most stunning effect is smooth scrolling of the partial bitmap. Type POKE 252,*n*, where *n* is the direction. The values for *n* are as follows:

1 Up (bit 0)
2 Down (bit 1)
4 Right (bit 2)
5 Up and right (bits 0 and 2)
6 Down and right (bits 1 and 2)
8 Left (bit 3)
9 Up and left (bits 0 and 3)
10 Down and left (bits 1 and 3)

To change the color of the border section or the background in the graphics mode, type POKE 253,*n*, where *n* is the color number. (Note that the foreground color in graphics mode is always black.)

The next mode, executed by typing SYS 2089, displays the current graphics buffer in the screen area. With this mode turned on and location 251 set to graphics mode, you can display 262 lines of data out of the 264 lines of data in the buffer. Or, with 251 set to normal or sprite mode, you can display 200 lines of the graphics buffer in the normal screen area. To disable this mode type SYS 2092.

Graphics Buffer

The graphics buffer, found at 3080–3343 ($0C08–$0D0F), contains 264 bytes. To program a certain line in the partial bitmap, just POKE the data to the corresponding memory location. Location 3080 ($0C08) corresponds to the top of the border area at the bottom of the screen. Each location following 3080 corresponds to the next lower line. The lines wrap from the bottom back to the top and continue down to the last line of the normal screen area, which is location 3341 ($0D0D). Just remember, one eight-bit number controls the whole line. To turn all the pixels in line 0 off, type POKE 3080,0. To turn them all on, use POKE 3080,255. You can set alternative pixels on by using POKE 3080,170.

Hints and Tips

- Disable Supratechnic with SYS 2086 before any nonkeyboard I/O.
- Always set the locations of the sprites before turning them on.
- Avoid using any cartridges or programs (such as fast loaders) that will steal or corrupt IRQ timing. If you must use fast loaders, disable Supratechnic before using any of its features. (Use SYS 2086 to disable, SYS 2083 to reenable.)
- In the graphics mode, avoid placing sprites on the border. It will cause a lot of flicker if they're on the *y* coordinates of 231–255 or 0–6. But they can be in the range 7–230 with very few or no problems.
- When programming the graphics buffer, make sure the screen doesn't scroll, or else the graphics will get jumbled up.

Because of conflicting interrupts, you should use a program similar to Program 3 to load and run Supratechnic with your own programs. Simply modify the filename in line 40 so that it loads your program instead of SUPRA.DEMO.

See program listings on page 90.

CUSTOM BOOT

Don J. Reynolds

With this program, your 128 will always boot up just the way you like. Start every computing session with your favorite column width, screen colors, and function-key definitions. A disk drive is required.

Among BASIC 7.0's many features are commands that make it easy to set the screen width and colors and define the function keys. Many people type these commands in immediate mode after they boot. "Custom Boot" does the work for you. It writes a short boot program to your disk which sets the screen width, background, border, and character colors, defines the function keys, and finally loads and runs any program you wish.

Typing It In

Custom Boot is written entirely in BASIC. To prevent typing errors, use "The Automatic Proofreader" when you enter the program. When you've finished typing, save a copy to disk.

To use Custom Boot, load and run the program. First, the program asks which mode you want to use for booting up. Type 40 for 40-column mode or 80 for 80-column mode. Next, Custom Boot asks whether you wish to redefine the function keys. If you decide not to define them, the default definitions are used. If you do decide to redefine the function keys, Custom Boot displays the prompt

```
SELECT F-KEY TO DEFINE (1-8)?
```

Press the number corresponding to the function key and type the string to be assigned to that key. You need assign only the keys you wish to change. For example, if you want a function key to execute a BASIC command, such as DIRECTORY, you type the following:

```
"DIRECTORY"+CHR$(13)
```

Custom Boot uses the string you enter in a KEY command, so anything legal in BASIC's KEY command will work here.

Now, Custom Boot displays a color chart and requests that you choose the background and character colors. If you are booting in 40 columns, you'll also be asked to choose a border color. Valid color numbers are 1–16.

Booting Another

Finally, Custom Boot asks whether you want to run another program, load another program, or execute a NEW command. Respond by typing either RUN, LOAD, or NEW. If you reply with RUN or LOAD, you're then asked for the name of a file to be run or loaded. If you type LOAD, you must also choose between a relocatable load (,8) and a nonrelocatable load (,8,1). If you don't want a program to be loaded or run, choose NEW.

After you've answered the questions, put your boot disk in drive 8 and press RETURN. The boot block, function-key definitions, and a boot file will be written to the disk. If the disk already contains a boot block, Custom Boot will write over it.

See program listing on page 88.

Blow up any section of your 64's text screen for a clean, easy-to-read display.

Robert Bixby

"Magnifier" is a short machine language utility that enlarges any portion of the text screen to 64 times its normal size. The magnified region is shown on an alternate text screen, and you can switch back and forth between screens easily. Magnifier can help young children and the visually impaired to use the computer. You can even use it while programming in BASIC.

Getting Started

Magnifier is written entirely in machine language, so you must type it in using "MLX," the machine language entry program found elsewhere in this issue. When MLX prompts you, respond with the values given below.

Starting address: 0801
Ending address: 0C40

Before exiting MLX, be sure to save a copy to tape or disk.

Although it's written in machine language, Magnifier can be loaded, saved, and run as if it were a BASIC program. When you run Magnifier, it relocates itself to a safe place in memory, so *do not* try to save it after it has been run. To reset BASIC's pointers, type NEW after you've run Magnifier.

Magnifier places a rectangular sprite on the screen. This rectangle represents the portion of the screen that is shown magnified on the alternate text screen. You can move the rectangle by using the cursor keys in conjunction with the CTRL key. Simply hold down the CTRL key and then move the rectangle as you would move BASIC's text cursor.

You can switch to the magnified screen by pressing CTRL-Z. CTRL–SHIFT–Z returns to the normal text screen. The positioning rectangle is visible on both screens, so you can move it from either screen.

To disable Magnifier, turn the computer off and then back on.

How It Works

Magnifier first copies the entire character set to RAM beginning at location 12288. The algorithm for this was adapted from *Programming the Commodore 64*, available from COMPUTE! Books. Magnifier moves the start of BASIC memory to 16384, leaving 24K available for BASIC programming. This is necessary because of the space taken up by the character set and the program. Note that Magnifier works with redefined character sets.

The characters are enlarged by examining each individual bit of the character definition. If the bit is a 1, a value of 160 (a reverse space) is stored in the appropriate location on the second text screen; a 32 (a space) is used if the bit is a 0.

Because of the amount of time it takes to refresh the alternate screen, BASIC runs a little more slowly than usual when the large-text screen is showing. For maximum speed, the second screen's refresh only occurs if it is visible (and then only once for every five refreshes of the normal screen) or if the positioning rectangle is moved.

See program listing on page 97.

Block Out

Article on page 54.

Program 1: Block Out—BASIC Section

```
AC 10 REM COPYRIGHT 1988 COMPU
      TE! PUBLICATIONS - ALL R
      IGHTS RESERVED
MD 20 PRINT"{CLR}{3 SPACES}COP
      YRIGHT 1988 COMPUTE! PUB
      ., INC.":PRINTTAB(11)"AL
      L RIGHTS RESERVED":SLEEP
      5
FJ 30 COLOR0,1:COLOR4,1:GRAPHI
      C3,1:DIMCL(14,9):DIMPT(1
      4,9):DIMY(20):SC(1)=0:SC
      (2)=0
AX 40 FAST:BLOAD"SPRITES":SPRS
      AV1,B$(1):SPRSAV2,B$(2):
      SPRSAV3,B$(3):SPRSAV4,B$
      (4):SPRSAV5,B$(5):SPRSAV
      6,PI$:SPRSAV7,SE$:SPRSAV
      8,BL$
PF 50 GSHAPEB$(1),0,0:SSHAPEB$
      (1),0,0,7,15:GSHAPEB$(2)
      ,0,0:SSHAPEB$(2),0,0,7,1
      5:GSHAPEB$(3),0,0:SSHAPE
      B$(3),0,0,7,15:GSHAPEB$(
      4),0,0:SSHAPEB$(4),0,0,7
      ,15
BB 60 GOSUB900:GRAPHIC3,1:X=RN
      D(-TI):FAST
GF 70 COLOR1,15:COLOR3,4:COLOR
      2,7:BOX2,0,32,159,39:BOX
      1,1,33,158,38:BOX3,2,34,
      157,37:COLOR1,13:COLOR3,
      16:COLOR2,12
AF 80 FORX=4TO158STEP12:GSHAPE
      PI$,X,40:NEXT:COLOR1,8:C
      HAR1,2,1,"1UP":CHAR1,1,3
      ,"0"
GE 90 COLOR1,11:CHAR1,19,1,"2U
      P":CHAR1,18,3,"0":SLOW
HC 100 FORX=1TO13:FORY=1TO9:CL
      (X,Y)=0:PT(X,Y)=0:NEXT:
      NEXT
QA 110 FORX=1TO13:Y(X)=8:NEXT
SE 120 XX=24:LM=72:N=0:S=0
CP 130 PA=INT(RND(1)*4)+1:IFPA
      =5THEN130
JR 140 CO(1)=INT(RND(0)*5)+1:I
      FCO(1)=6THEN140
SC 150 S=S+1:IFCO(1)=1THENCO(1
      )=7:CO(2)=15:GOTO200
RB 160 IFCO(1)=2THENCO(1)=9:CO
      (2)=8:GOTO200
AQ 170 IFCO(1)=3THENCO(1)=3:CO
      (2)=11:GOTO200
GJ 180 IFCO(1)=4THENCO(1)=12:C
      O(2)=13:GOTO200
EK 190 IFCO(1)=5THENCO(1)=6:CO
      (2)=14:GOTO200
HB 200 COLOR1,CO(1):COLOR3,CO(
      2):GSHAPEB$(PA),XX,8:XX
      =XX+12:CA(S)=CO(1):CB(S
      )=CO(2):P(S)=PA:IFXX=LM
      THEN220
QX 210 GOTO130
PR 220 N=N+1:XX=92:LM=140:IFN=
      2THEN240
HA 230 GOTO130
XB 240 SPRSAVSE$,1
BD 250 LL=72:LR=144:J=1:XX=72:
      YY=58
HS 260 MOVSPR1,XX,YY:SPRITE1,1
      ,2,0,0,0,1
KQ 270 IFJOY(J)=7ANDXX>LLTHENM
      OVSPR1,XX-24,YY:SOUND1,
      1000,2,,,,3:XX=XX-24
EM 280 IFJOY(J)=3ANDXX<LRTHENM
      OVSPR1,XX+24,YY:SOUND1,
      1000,2,,,,3:XX=XX+24
RS 290 IFJOY(J)>127THEN320
SS 300 FORI=1TO20:NEXT
QJ 310 GOTO270
QR 320 SOUND1,9635,5,,,,0
QG 330 IFXX=72THENS=1:XE=24:SC
      =1
HX 340 IFXX=96THENS=2:XE=36:SC
      =1
XD 350 IFXX=120THENS=3:XE=48:S
      C=1
DH 360 IFXX=144THENS=4:XE=60:S
      C=1
GP 370 IFXX=208THENS=5:XE=92:S
      C=2
PE 380 IFXX=232THENS=6:XE=104:
      SC=2
DK 390 IFXX=256THENS=7:XE=116:
      SC=2
BG 400 IFXX=280THENS=8:XE=128:
      SC=2
DR 410 COLOR1,CA(S):COLOR3,CB(
      S)
AH 420 GSHAPEBL$,XX/2-12,YY-50
AP 430 MOVSPR1,32,90:XX=32
KR 440 IFJOY(J)=7ANDXX>32THENM
      OVSPR1,XX-24,90:SOUND1,
      1000,2,,,,3:XX=XX-24
XD 450 IFJOY(J)=3ANDXX<320THEN
      MOVSPR1,XX+24,90:SOUND1
      ,1000,2,,,,3:XX=XX+24
HD 460 IFJOY(J)>127THEN480
PC 470 GOTO440
JK 480 XX=XX/2-12:X=(XX+8)/12
GX 490 IFX<0THENX=0
QR 500 IFY(X)<1THENXX=(XX+12)*
      2:GOTO440
BJ 510 SOUND1,9635,5,,,,0
BJ 520 GSHAPEB$(P(S)),XX,(Y(X)
      *2+5)*8:Y=Y(X):Y(X)=Y(X
      )-1
GB 530 IFCA(S)=7THENCL(X,Y)=1
DR 540 IFCA(S)=9THENCL(X,Y)=2
QA 550 IFCA(S)=3THENCL(X,Y)=3
MA 560 IFCA(S)=12THENCL(X,Y)=4
SK 570 IFCA(S)=6THENCL(X,Y)=5
HD 580 PT(X,Y)=P(S)
EE 590 IFCL(X,Y)=CL(X+1,Y) THE
      N SC(SC)=SC(SC)+15
RK 600 IFCL(X,Y)=CL(X,Y+1) THE
      N SC(SC)=SC(SC)+15
DB 610 IFCL(X,Y)=CL(X-1,Y) THE
      N SC(SC)=SC(SC)+15
AF 620 IFPT(X,Y)=PT(X+1,Y) THE
      N SC(SC)=SC(SC)+25
MK 630 IFPT(X,Y)=PT(X,Y+1) THE
      N SC(SC)=SC(SC)+25
EB 640 IFPT(X,Y)=PT(X-1,Y) THE
      N SC(SC)=SC(SC)+25
AQ 650 SC$=STR$(SC(SC)):IFSC=1
      THEN670
DM 660 IFSC=2THEN680
XH 670 COLOR1,8:CHAR1,0,3,SC$:
      GOTO690
ED 680 COLOR1,11:CHAR1,17,3,SC
      $
MJ 690 RA=INT(RND(1)*4)+1:IFRA
      =5THEN690
AE 700 P(S)=RA
MQ 710 CO=INT(RND(1)*5)+1:IFCO
      =6THEN710
HP 720 IFCO=1THENCA(S)=7:CB(S)
      =15
QP 730 IFCO=2THENCA(S)=9:CB(S)
      =8
RC 740 IFCO=3THENCA(S)=3:CB(S)
      =11
ES 750 IFCO=4THENCA(S)=12:CB(S
      )=13
PG 760 IFCO=5THEN CA(S)=6:CB(S
      )=14
KE 770 COLOR1,CA(S):COLOR3,CB(
      S):GSHAPEB$(P(S)),XE,8
XQ 780 FG=0:FORKY=1TO13:IFY(KY
      )=0THENFG=FG+1
BM 790 NEXT:IFFG=13THEN840
AM 800 IFJ=1THEN820
CJ 810 IFJ=2THEN830
PX 820 LL=208:LR=280:XX=208:J=
      2:GOTO260
AF 830 LL=72:LR=144:XX=72:J=1:
      GOTO260
EA 840 SC$(1)=STR$(SC(1)):SC$(
      2)=STR$(SC(2))
AH 850 SPRITE1,0
GC 860 GRAPHIC1,1:COLOR1,8:CHA
      R1,14,3,"GAME OVER":CHA
      R1,13,5,"FINAL SCORES:"
EF 870 CHAR1,10,9,"PLAYER 1 SC
      ORE: ":CHAR1,29,9,SC$(1
      )
MA 880 CHAR1,10,12,"PLAYER 2 S
      CORE: ":CHAR1,29,12,SC$
      (2)
AH 890 RUN
DA 900 GSHAPEBL$,0,0:COLOR1,13
      :COLOR3,12:COLOR2,16
KS 910 FORI=16TO120STEP8:GSHAP
      EB$(1),I,32:GSHAPEB$(3)
      ,I,56:NEXT
PF 920 SLOW:CHAR2,9,6,"BLOCK
      {4 SPACES}-{4 SPACES}OU
      T"
DM 930 CHAR2,6,12,"PLAYER1 - J
      OYSTICK PORT 1"
XA 940 CHAR2,6,14,"PLAYER2 - J
      OYSTICK PORT 2"
MB 950 CHAR2,11,18,"PRESS ANY
      {SPACE}KEY"
AD 960 GETKEYKY$
MC 970 RETURN
```

Program 2: Block Out—Sprite Data

See instructions in article on page 54 before typing in.

```
0E00:D5 55 00 D5 55 00 DF FD 22
0E08:00 D0 0D 00 DD 5D 00 DD 3C
0E10:5D 00 DF FD 00 D0 0D 00 14
0E18:D0 0D 00 D0 0D 00 D0 0D 04
0E20:00 D0 0D 00 D0 0D 00 D5 A2
0E28:55 00 D5 55 00 FF FF 00 FE
0E30:00 00 00 00 00 00 00 00 4C
0E38:00 00 00 00 00 00 00 00 54
0E40:D5 55 00 D5 55 00 DF FD 62
0E48:00 D0 0D 00 D0 0D 00 D0 C5
0E50:0D 00 D0 0D 00 D0 0D 00 3B
0E58:D0 0D 00 DD 5D 00 DD 5D 02
0E60:00 DF FD 00 D0 0D 00 D5 C4
0E68:55 00 D5 55 00 FF FF 00 3F
0E70:00 00 00 00 00 00 00 00 8C
0E78:00 00 00 00 00 00 00 00 94
0E80:D5 55 00 D5 55 00 DF FD A2
0E88:00 D0 0D 00 DD 5D 00 DD BC
0E90:5D 00 DF FD 00 D0 0D 00 94
0E98:D0 0D 00 DD 5D 00 DD 5D 42
0EA0:00 DF FD 00 D0 0D 00 D5 05
0EA8:55 00 D5 55 00 FF FF 00 7F
0EB0:00 00 00 00 00 00 00 00 CC
0EB8:00 00 00 00 00 00 00 00 D4
0EC0:D5 55 00 D5 55 00 DF FD E2
0EC8:00 D0 0D 00 DD 5D 00 DD FC
0ED0:5D 00 DD 5D 00 DD 5D 00 5F
0ED8:DD 5D 00 DD 5D 00 DD 5D 1D
0EE0:00 DF FD 00 D0 0D 00 D5 45
0EE8:55 00 D5 55 00 FF FF 00 BF
0EF0:00 00 00 00 00 00 00 00 0D
0EF8:00 00 00 00 00 00 00 00 15
0F00:D5 55 00 D5 55 00 D5 FD 10
0F08:00 D5 0D 00 D5 4D 00 D5 F6
0F10:4D 00 DD 5D 00 DD 5D 00 98
0F18:DD 5D 00 D3 55 00 D3 55 61
```

```
0F20:00 D0 D5 00 D0 D5 00 D5 E0
0F28:55 00 D5 55 00 FF FF 00 01
0F30:00 00 00 00 00 00 00 00 4E
0F38:00 00 00 00 00 00 00 00 56
0F40:A9 7F 00 AA 57 00 A5 5F 23
0F48:00 A9 7F 00 A9 5F 00 AA 36
0F50:5F 00 A5 57 00 AA 5F 00 B1
0F58:A9 7F 00 A9 5F 00 AA 7F 95
0F60:00 A5 5F 00 AA 5F 00 A9 50
0F68:57 00 A9 5F 00 A5 7F 00 F2
0F70:00 00 00 00 00 00 00 00 8E
0F78:00 00 00 00 00 00 00 00 96
0F80:AA AA 00 80 02 00 80 02 B9
0F88:00 80 02 00 80 02 00 80 93
0F90:02 00 80 02 00 80 02 00 E5
0F98:80 02 00 80 02 00 80 02 92
0FA0:00 80 02 00 80 02 00 80 AB
0FA8:02 00 80 02 00 AA AA 00 F7
0FB0:00 00 00 00 00 00 00 00 CE
0FB8:00 00 00 00 00 00 00 00 D6
0FC0:00 00 00 00 00 00 00 00 DE
0FC8:00 00 00 00 00 00 00 00 E6
0FD0:00 00 00 00 00 00 00 00 EE
0FD8:00 00 00 00 00 00 00 00 F6
0FE0:00 00 00 00 00 00 00 00 FE
0FE8:00 00 00 00 00 00 00 00 07
0FF0:00 00 00 00 00 00 00 00 0F
0FF8:00 00 00 00 00 00 00 00 17
```

Custom Boot

Article on page 83.

```
HE 10 REM COPYRIGHT 1988 COMPU
      TE! PUBLICATIONS, INC. -
       ALL RIGHTS RESERVED
KC 20 FORI=0TO30:READA:X=X+A:N
      EXT:IFX<>1775THENPRINT"D
      ATA ERROR.":STOP:ELSE:RE
      STORE
HJ 30 DATA67,66,77,0,0,0,0,70,
      73,76,69,0,0,162,19,160,
      11,76,165,175,82,85,78,3
      4,46,66,84,34,0,0,0
HK 40 POKE53280,0:POKE53281,0:
      B$="{RVS}{20 SPACES}":C$
      =CHR$(34):A$(4)="1"
DR 50 PRINT"{CLR} {RVS}{5$}
      {10 SPACES}128 CUSTOM BO
      OT{12 SPACES}"
PK 60 PRINTTAB(3)"{DOWN}COPYRI
      GHT 1988 COMPUTE! PUB.,
      {SPACE}INC.":PRINTTAB(11
      )"ALL RIGHTS RESERVED"
RD 70 INPUT"{2 DOWN}{7$}{RVS} S
      ELECT # OF COL (40 OR 80
      ) {OFF}{WHT}";A$(2):IFA$
      (2)<>"40"ANDA$(2)<>"80"T
      HEN70
BH 80 INPUT"{2 DOWN}{7$}{RVS} D
      EFINE FUNCTION KEYS? (Y/
      N) {OFF}{WHT}";A$(1):IFA
      $(1)<>"Y"THEN120
GB 90 F$="":INPUT"{2 DOWN}{7$}
      {RVS} SELECT F-KEY TO DE
      FINE (1-8){OFF}{WHT}";F$
      :F=VAL(F$):IFF$=""THEN12
      0
ER 100 GOSUB500:PRINT:IFA$=""T
       HEN90
RE 110 F$(F)=A$:GOTO90
XS 120 GOSUB550:INPUT"{DOWN}
       {RVS}{7$} SELECT BACKGRO
       UND COLOR (1-16) {OFF}"
       ;A$(3):IFVAL(A$(3))<1OR
       VAL(A$(3))>16THEN120
BH 130 IFA$(2)<>"80"THENGOSUB5
       50:INPUT"{DOWN}{RVS}{7$}
        SELECT BORDER COLOR (1
       -16) {OFF}";A$(4):IFVAL
       (A$(4))<1ORVAL(A$(4))>1
       6THEN130
AG 140 GOSUB550:INPUT"{DOWN}
       {RVS}{7$} SELECT CHARACT
       ER COLOR (1-16) {OFF}";
       A$(5):IFVAL(A$(5))<1ORV
       AL(A$(5))>16THEN140
HC 150 INPUT"{CLR}{2 DOWN}
       {RVS}{7$} SELECT COMMAND
        (RUN/LOAD/NEW){OFF}
       {WHT}";A$(6):IFA$(6)="R
       UN"THEN200
BG 160 IFA$(6)="LOAD"THEN190
FA 170 IFA$(6)="NEW"THEN210
XX 180 GOTO150
MK 190 INPUT"{CLR}{2 DOWN}
       {RVS}{7$} EXTENSION (0 F
       OR,8 OR 1 FOR ,8,1)
       {OFF}{WHT}";A$(7):IFVAL
       (A$(7))<0ORVAL(A$(7))>1
       THEN190
GE 200 INPUT"{CLR}{2 DOWN}
       {RVS}{7$} ENTER FILE NAM
       E TO BOOT ";A$(8)
BD 210 PRINT"{CLR}{5 DOWN}
       {WHT} INSERT DISK AND P
       RESS {RVS}RETURN{OFF} T
       O WRITE ":GETKEYK$:PRIN
       T"{CLR}{2 DOWN}{WHT}WRI
       TING..."
XX 220 OPEN15,8,15,"S0:.FK":PR
       INT#15,"S0:.BT":CLOSE15
       :IFA$(1)<>"Y"THEN270
BA 230 CLOSE2:OPEN2,8,2,"0:.FK
       ,S,W":CLOSE15:OPEN15,8,
       15
QS 240 FORN=1TO8:IFF$(N)=""THE
       NF$(N)=CHR$(34)
KA 250 PRINT#2,F$(N):NEXT
JB 260 INPUT#15,E$(1),E$(2),E$
       (3),E$(4):CLOSE15
PH 270 PRINT"{CLR}{3 DOWN}5 C$
       =CHR$(34):CO$=";C$;A$(2
       );C$;":IF(PEEK(215)=0AN
       DCO$=";C$;"80";C$;")OR(
       PEEK(215)<>0ANDCO$=";C$
       ;"40";C$;")THENPRINTCHR
       $(27);";C$;"X";C$
FF 280 PRINT"7 BK=";VAL(A$(3))
       ;":BD=";VAL(A$(4));":CH
       =";VAL(A$(5));":COLOR0,
       BK:COLOR6,BK:COLOR4,BD:
       COLOR5,CH"
QQ 290 IFA$(1)<>"Y"THEN330
RP 300 PRINT"10 CLOSE2:OPEN2,8
       ,2,";C$;"0:.FK,S,R";C$;
       ":FORN=1TO8:INPUT#2,F$(
       N):NEXT:CLOSE2:N=0"
AJ 310 PRINT"30 IFN=>8THEN40
QX 320 PRINT"32 N=N+1:PRINT";C
       $;"{CLR}{3 DOWN}KEY";C$
       ;";N;";C$;",";C$;";C$;F
       $(N):PRINT";C$;"
       {2 DOWN}GOTO30{HOME}";C
       $;":POKE842,13:POKE843,
       13:POKE208,2:END
GS 330 IFA$(6)="NEW"THENPRINT"
       40 NEW":GOTO390
EE 340 PRINT"40 PRINT";C$;"
       {CLR}{3 DOWN}";A$(6);
DJ 350 PRINTC$;";C$;";C$;A$(8)
       ;C$;";C$;";:IFA$(7)="1"
       THENPRINTC$;",8,1";C$:G
       OTO380
HE 360 IFA$(6)<>"RUN"THENPRINT
       C$;",8{HOME}";C$;:GOTO3
       80
GS 370 PRINT:PRINT"50 PRINT";C
       $;"{4 DOWN}RUN{HOME}";C
       $;
CK 380 PRINT":POKE842,13:POKE8
       43,13:POKE208,2:NEW"
MG 390 PRINT"SAVE";C$;".BT";C$
       ;",8"
QS 400 WS$="":FORN=1TO30:READX
       :WS$=WS$+CHR$(X):NEXT
GG 410 OPEN15,8,15:OPEN5,8,5,"
       #"
FE 420 PRINT#15,"B-P";5;0
FJ 430 PRINT#5,WS$
BJ 440 PRINT#15,"U2";5;0;1;0
KA 450 INPUT#15,E$(1),E$(2),E$
       (3),E$(4)
DM 460 CLOSE5:CLOSE15
FA 470 PRINT"{HOME}":FORN=842T
       O850:POKEN,13:NEXT:POKE
       208,10:NEW
CC 480 PRINT"{CLR}{2 DOWN}":FO
       RN=1TO4:PRINTE$(N);:NEX
       T
FF 490 END
JB 500 A$="":PRINTCHR$(34);
KG 510 GETK$:IFK$=""THEN510
RS 520 IFK$=CHR$(20)THENA$=LEF
       T$(A$,(LEN(A$)-1)):PRIN
       TK$;:GOTO510
SK 530 IFK$=CHR$(13)THENRETURN
SF 540 A$=A$+K$:PRINTK$;:GOTO5
       10
XA 550 PRINT"{CLR} {RVS}{8$}COL
       OR SELECTION{2 DOWN}":F
       ORN=2TO16:COLOR5,N:PRIN
       TN;"..";B$:NEXT:RETURN
```

Rally Racer

Article on page 46.

Program 1: Rally Racer—BASIC Section

```
HE 10 REM COPYRIGHT 1988 COMPU
      TE! PUBLICATIONS, INC. -
       ALL RIGHTS RESERVED
RH 20 PRINT"{CLR}{3 SPACES}COP
      YRIGHT 1988 COMPUTE! PUB
      ., INC."
CA 30 PRINTTAB(11)"ALL RIGHTS
      {SPACE}RESERVED"
EG 40 IFL=0THENL=1:LOAD"RALLYC
      ODE",8,1
ES 50 SP=53248:POKESP+21,255:F
      ORX=0TO7:POKESP+X*2,X*28
      +40:POKESP+1+X*2,90
DA 60 POKE2040+X,X+248:NEXT:PO
      KE53281,0:POKE53280,0
GE 70 PRINT"{CLR}{YEL}BUILDING
       SPRITES.."
CH 80 FORX=0TO64:READZ:A=A+Z:P
      OKE828+X,Z:NEXT
QD 90 IFA-7027THENPRINT"ERROR
      {SPACE}IN ML DATA":END
QR 100 S1=15872:S2=S1+64:S3=S2
       +64:S4=S3+64:S5=S4+64:S
       6=S5+64:S7=S6+64:S8=S7+
       64
BD 110 FORY=0TO191:READZ:B=B+Z
       :POKES1+Y,Z:NEXT
HK 120 IFB-20723THENPRINT"ERRO
       R IN SPRITE DATA":END
AH 130 A=S4:B=S2:GOSUB190:A=S5
       :B=S1:GOSUB190
HE 140 A=S6:B=S4:GOSUB200:A=S7
       :B=S3:GOSUB200
FC 150 A=S8:B=S2:GOSUB200:POKE
       792,0:POKE793,192:POKES
       P+21,0
DA 160 PRINT"{DOWN}BUILDING TR
       ACK..":FORX=0TO413:READ
       Z:C=C+Z:POKEX+14848,Z:N
       EXT
JS 170 IFC-58451THENPRINT"ERRO
       R IN TRACK DATA":END
```

```
AP 180 POKE631,13:POKE198,1:SY
       S50689
AC 190 FORY=0TO21:FORX=0TO2:PO
       KEA+63-Y*3+X,PEEK(B+Y*3
       +X):NEXT:NEXT:RETURN
DD 200 FORY=0TO21:FORX=0TO2:PO
       KEA+Y*3+2-X,PEEK(B+Y*3+
       X):NEXT:NEXT
KX 210 POKE254,A/256:POKE253,A
       -PEEK(254)*256:SYS828:R
       ETURN
EK 220 REM{6 SPACES}ML DATA
MS 230 DATA165,253,133,251,165
       ,254,133,252,160,0,169,
       0,141,125
QC 240 DATA3,162,0,177,251,61,
       109,3,240,9,189,117,3,1
       3,125,3
SF 250 DATA141,125,3,232,224,8
       ,208,235,173,125,3,145,
       251,200
QC 260 DATA192,64,208,218,96,1
       ,2,4,8,16,32,64,128,128
       ,64,32,16,8,4,2,1
QC 270 REM{6 SPACES}SPRITE DAT
       A
PD 280 DATA0,0,0,0,126,0,3,255
       ,192,15,255,240
GM 290 DATA15,255,240,15,255,2
       40,15,0,240,6,0,96
DF 300 DATA7,255,224,7,255,224
       ,7,255,224,7,255,224
FK 310 DATA15,255,240,30,0,120
       ,31,0,248,31,255,248
DG 320 DATA31,255,248,31,255,2
       48,1,255,128,0,0,0
EE 330 DATA0,0,0,0,0,0,0,0,62,
       0,0,127
FJ 340 DATA128,0,127,224,0,255
       ,240,1,227,248,31,241
GP 350 DATA248,63,248,248,127,
       252,124,126,254,124,60,
       127
EX 360 DATA126,62,63,252,31,31
       ,232,31,143,224,15,199
DH 370 DATA192,7,227,128,3,255
       ,128,0,255,128,0,127
CG 380 DATA0,0,30,0,0,0,0,0,0,
       0,0,0
SG 390 DATA0,0,0,0,0,63,0,0,63
       ,129,248,63
MB 400 DATA255,248,127,255,252
       ,124,254,124,120,254,62
       ,120
DA 410 DATA254,62,120,254,62,1
       20,254,62,120,254,62,12
       4
JM 420 DATA254,124,127,255,252
       ,63,255,248,63,129,248,
       63
XQ 430 DATA0,0,0,0,0,0,0,0,0,0
       ,0,0
AB 440 REM{6 SPACES}TRACK DATA
PF 450 DATA255,255,224,192,192
       ,194,199,199
FS 460 DATA255,255,63,3,0,0,24
       0,255
PX 470 DATA255,255,254,252,60,
       28,8,0
HH 480 DATA255,255,0,0,63,127,
       127,127
SS 490 DATA255,255,0,0,255,254
       ,252,252
AM 500 DATA255,255,0,0,255,3,1
       ,113
KR 510 DATA255,255,7,0,255,255
       ,240,224
RJ 520 DATA255,255,240,0,240,2
       55,0,0
CJ 530 DATA255,255,0,0,60,252,
       0,0
BC 540 DATA255,255,127,63,63,6
       3,63,63
HS 550 DATA199,199,199,199,199
       ,199,199,199
SG 560 DATA255,255,255,241,192
       ,128,0,7
KM 570 DATA128,192,255,127,63,
       31,15,15
GM 580 DATA126,252,252,252,252
       ,252,128,0
QF 590 DATA0,0,28,62,62,62,126
       ,254
EP 600 DATA33,1,3,63,63,63,31,
       0
RS 610 DATA192,193,192,224,240
       ,252,254,62
GC 620 DATA0,255,255,31,15,15,
       15,15
DB 630 DATA0,255,255,255,255,1
       92,128,131
DQ 640 DATA127,255,255,255,255
       ,31,15,7
CJ 650 DATA199,199,199,199,194
       ,192,224,255
PK 660 DATA15,15,15,15,15,31,6
       3,255
AH 670 DATA143,143,143,143,143
       ,143,143,143
AA 680 DATA15,31,31,15,0,0,128
       ,255
ER 690 DATA255,255,255,255,0,0
       ,0,255
RF 700 DATA0,248,254,254,63,31
       ,15,15
MB 710 DATA30,14,14,15,15,15,1
       5,15
KS 720 DATA6,0,0,0,255,255,255
       ,255
EQ 730 DATA7,15,31,127,255,240
       ,224,192
KC 740 DATA135,135,135,135,7,7
       ,15,31
RS 750 DATA255,255,254,248,240
       ,240,241,241
DX 760 DATA255,255,0,0,0,255,2
       40,224
SE 770 DATA143,15,15,15,31,255
       ,7,3
RR 780 DATA255,255,240,224,192
       ,192,195,195
EC 790 DATA255,255,63,15,7,7,7
       ,3
QS 800 DATA143,143,143,143,143
       ,143,143,135
KK 810 DATA7,3,0,128,255,255,2
       55,255
RE 820 DATA255,128,0,0,224,240
       ,240,240
MK 830 DATA195,195,65,64,96,11
       2,127,127
BF 840 DATA255,255,255,15,7,3,
       3,131
FJ 850 DATA240,240,248,255,255
       ,255,255,255
MR 860 DATA128,3,7,255,255,255
       ,255,255
GS 870 DATA3,129,192,192,224,2
       55,255,255
AJ 880 DATA195,131,3,3,7,255,2
       55,255
HB 890 DATA3,1,0,0,0,128,255,2
       55
AA 900 DATA128,192,255,255,0,0
       ,255,255
AS 910 DATA15,7,7,7,15,31,255,
       255
SG 920 DATA240,240,240,240,248
       ,252,254,255
DS 930 DATA255,255,127,0,0,0,0
       ,255
DA 940 DATA195,131,3,7,15,31,1
       27,255
HH 950 DATA255,255,255,255,255
       ,255,255,255
DA 960 DATA191,191,191,191,191
       ,191
```

Program 2: Rally Racer—ML Section

See instructions in article on page 46 before typing in.

```
C000:A9 00 8D 18 03 A9 C0 8D 57
C008:19 03 A2 00 8A 9D 00 D4 CA
C010:E8 E0 18 D0 F8 8D 15 D0 47
C018:A9 0F 8D 18 D4 A9 F0 8D 22
C020:06 D4 8D 0D D4 78 A9 31 69
C028:8D 14 03 58 4C F5 C8 A9 D0
C030:00 8D 21 D0 8D C2 CA 8D E0
C038:C3 CA 20 C6 C3 AD AF CA BD
C040:8D 20 04 AD B0 CA 8D 21 D8
C048:04 AD B1 CA 8D 23 04 AD C8
C050:B2 CA 8D 24 04 AD B3 CA DA
C058:8D 26 04 A9 BD 8D BC CA AD
C060:8D BE CA A9 3C 8D BD CA AA
C068:8D BF CA 20 6E C3 A2 FE C2
C070:8E F8 07 8E 02 D0 8E F9 AB
C078:07 A9 03 8D 15 D0 A9 57 B7
C080:8D 00 D0 A9 88 8D 01 D0 CA
C088:8D 03 D0 A9 06 8D 27 D0 CB
C090:A9 01 8D 28 D0 8D D9 CA 96
C098:8D DA CA 78 A9 7E 8D 14 EE
C0A0:03 58 AD 1F D0 EE C4 CA F7
C0A8:AD C4 CA C9 02 90 33 A9 8A
C0B0:00 8D C4 CA AD 01 DC 29 2F
C0B8:04 D0 12 AD F8 07 38 E9 CB
C0C0:01 C9 F7 D0 02 A9 FF 8D 85
C0C8:F8 07 4C E2 C0 AD 01 DC DB
C0D0:29 08 D0 0E AD F8 07 18 5B
C0D8:69 01 C9 00 D0 E9 A9 F8 03
C0E0:D0 E5 EE C5 CA AD C5 CA E1
C0E8:C9 02 90 33 A9 00 8D C5 43
C0F0:CA AD 00 DC 29 04 D0 12 1E
C0F8:AD F9 07 38 E9 01 C9 F7 13
C100:D0 02 A9 FF 8D F9 07 4C 50
C108:1F C1 AD 00 DC 29 08 D0 AD
C110:0E AD F9 07 18 69 01 C9 E7
C118:00 D0 E9 A9 F8 D0 E5 AD 2C
C120:01 DC 29 01 D0 0A AD C2 5D
C128:CA C9 06 B0 03 EE C2 CA 73
C130:AD 01 DC 29 02 D0 08 AD 0A
C138:C2 CA F0 03 CE C2 CA AD E2
C140:00 DC 29 01 D0 0A AD C3 FD
C148:CA C9 06 B0 03 EE C3 CA 95
C150:AD 00 DC 29 02 D0 08 AD E9
C158:C3 CA F0 03 CE C3 CA AD 87
C160:C2 CA 8D 01 D4 A9 21 8D D6
C168:04 D4 AD C3 CA 8D 08 D4 86
C170:A9 21 8D 0B D4 AD C6 CA 29
C178:18 6D C2 CA 8D C6 CA C9 4F
C180:06 90 4A A9 00 8D C6 CA 9D
C188:AD F8 07 38 E9 F8 AA AD BB
C190:BC CA 8D C0 CA AD BD CA 36
C198:8D C1 CA BD 93 CA 8D B6 22
C1A0:CA BD 9B CA F0 15 AD BC 0D
C1A8:CA 38 ED B6 CA 8D BC CA 99
C1B0:AD BD CA E9 00 8D BD CA EE
C1B8:4C CD C1 AD BC CA 18 6D 97
C1C0:B6 CA 8D BC CA AD BD CA 23
C1C8:69 00 8D BD CA AD C7 CA F5
C1D0:18 6D C3 CA 8D C7 CA C9 CB
C1D8:06 90 4A A9 00 8D C7 CA F7
C1E0:AD F9 07 38 E9 F8 AA AD 54
C1E8:BE CA 8D C8 CA AD BF CA 14
C1F0:8D C9 CA BD 93 CA 8D B6 7C
C1F8:CA BD 9B CA F0 15 AD BE 67
C200:CA 38 ED B6 CA 8D BE CA F6
C208:AD BF CA E9 00 8D BF CA CC
C210:4C 25 C2 AD BE CA 18 6D F6
C218:B6 CA 8D BE CA AD BF CA A0
C220:69 00 8D BF CA 20 6E C3 7F
C228:AD 1F D0 20 5F C8 AD 1F 01
C230:D0 8D B6 CA 29 01 F0 11 45
C238:AD C0 CA 8D BC CA AD C1 25
C240:CA 8D BD CA A9 00 8D C2 1E
C248:CA AD B6 CA 29 02 F0 11 66
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C250:AD C8 CA 8D BE CA AD C9 57
C258:CA 8D BF CA A9 00 8D C3 77
C260:CA A2 00 AD BD CA DD A3 47
C268:CA D0 10 AD BC CA DD A6 D7
C270:CA D0 0D A9 00 8D D9 CA 80
C278:4C 80 C2 E8 E0 03 D0 E6 C6
C280:A2 00 AD BD CA DD A9 CA D4
C288:D0 10 AD BC CA DD AC CA ED
C290:D0 0D AD D9 CA D0 08 4C 0B
C298:FF C2 E8 E0 03 D0 E6 A2 C5
C2A0:00 AD BF CA DD A3 CA D0 1A
C2A8:10 AD BE CA DD A6 CA D0 16
C2B0:0D A9 00 8D DA CA 4C BE 59
C2B8:C2 E8 E0 03 D0 E6 A2 00 8D
C2C0:AD BF CA DD A9 CA D0 10 6E
C2C8:AD BE CA DD AC CA D0 0D 4B
C2D0:AD DA CA D0 08 4C 04 C3 87
C2D8:E8 E0 03 D0 E6 A2 07 FE 47
C2E0:09 04 BD 09 04 C9 BA D0 C1
C2E8:13 A9 B0 9D 09 04 CA E0 21
C2F0:06 F0 04 E0 03 D0 01 CA 6C
C2F8:E0 00 D0 E3 4C A5 C0 A2 64
C300:05 4C 06 C3 A2 1E A0 00 E8
C308:8C 04 D4 8C 0B D4 B9 68 C1
C310:C3 9D 28 04 E8 C8 C0 06 18
C318:D0 F4 AD 0A 04 8D B6 CA 2A
C320:AD 0B 04 8D B7 CA AD 0D EB
C328:04 8D B8 CA AD 0E 04 8D 14
C330:B9 CA AD 10 04 8D BA CA 94
C338:A2 00 BD B6 CA DD AF CA 2C
C340:F0 10 B0 13 BD B6 CA 9D 87
C348:AF CA E8 E0 05 D0 F5 4C 29
C350:57 C3 E8 E0 05 D0 E3 AD 80
C358:00 DC 29 10 F0 07 AD 01 3D
C360:DC 29 10 D0 F2 4C 00 C0 39
C368:97 89 8E 8E 85 92 AD 12 BC
C370:D0 C9 C8 D0 F9 A9 50 85 95
C378:FD A9 04 85 FE AD BC CA 35
C380:85 FB AD BD CA 85 FC 20 E1
C388:9C C3 A9 65 85 FD A9 04 56
C390:85 FE AD BE CA 85 FB AD 4E
C398:BF CA 85 FC A2 00 A0 00 89
C3A0:A5 FC C9 40 90 05 B1 FB 6F
C3A8:4C AD C3 A9 51 91 FD C8 6A
C3B0:C0 13 D0 EC A0 00 A9 F0 8F
C3B8:20 6A C8 A9 28 20 88 C8 3A
C3C0:E8 E0 14 D0 DB 60 A2 00 2A
C3C8:A9 A0 9D 00 04 9D 00 05 9C
C3D0:9D 00 06 9D E8 06 A9 02 76
C3D8:9D 00 D8 9D 00 D9 9D 00 C6
C3E0:DA 9D E8 DA E8 D0 E1 8D E3
C3E8:20 D0 A9 50 85 FB A9 D8 37
C3F0:85 FC A2 00 A0 00 A9 07 2E
C3F8:91 FB C8 C0 13 D0 F7 C8 02
C400:C8 A9 05 91 FB C8 C0 28 BE
C408:D0 F7 A9 28 20 6A C8 A0 8C
C410:00 E8 E0 14 D0 E0 A2 00 80
C418:BD 24 C4 20 D2 FF E8 E0 6D
C420:2A D0 F5 60 13 1C 1D 12 0D
C428:54 20 49 20 4D 20 45 20 A4
C430:20 30 30 3A 30 30 3A 30 66
C438:1D 1D 1D 1D 46 41 53 54 3F
C440:20 54 49 4D 45 20 20 20 F7
C448:20 3A 20 20 3A 20 A2 00 0E
C450:86 FD 86 FB A9 CE 85 FC BD
C458:A9 40 85 FE 8E B7 CA 8E DE
C460:B8 CA 8E B9 CA AC B9 CA AD
C468:B1 FB 8D B8 CA AD B8 CA 50
C470:0A 8D B8 CA 90 05 A9 A0 B2
C478:4C 7D C4 A9 20 A0 00 91 CF
C480:FD C8 91 FD C8 91 FD 8D 63
C488:B6 CA A9 F0 20 88 C8 AD C6
C490:B6 CA 91 FD 88 91 FD 88 49
C498:91 FD A9 ED 20 94 C8 E8 4C
C4A0:E0 08 D0 C9 A2 00 EE B9 FF
C4A8:CA AD B9 CA C9 0A D0 B5 B4
C4B0:8C B9 CA A9 0A 20 6A C8 51
C4B8:A9 F0 20 88 C8 EE B7 CA 1C
C4C0:AD B7 CA C9 28 D0 9E 4C 13
C4C8:39 C5 A0 00 8C B6 CA 8C D5
C4D0:B7 CA 8C B8 CA 84 FD A9 14
C4D8:CE 85 FE 84 FB A9 3A 85 D3
C4E0:FC AC B6 CA C0 00 F0 09 88
C4E8:A9 50 20 6A C8 88 4C E4 EB
C4F0:C4 A0 00 AD B7 CA 18 6D 66
C4F8:B8 CA 20 6A C8 B1 FB 91 D2
C500:FD A9 01 20 88 C8 AD B8 92
C508:CA 18 69 08 8D B8 CA C9 5B
C510:50 D0 C8 8C B8 CA EE B7 60
C518:CA AD B7 CA C9 08 D0 BB E3
C520:8C B7 CA EE B6 CA AD B6 1B
C528:CA C9 05 D0 AE 4C 03 C8 AE
C530:A5 FC 85 FE A5 FB 85 FD 94
C538:60 A0 00 84 FB A9 40 85 F0
C540:FC 20 BD C5 20 CE C5 20 4E
C548:DF C5 20 F0 C5 A0 00 A9 A2
C550:01 20 6A C8 A5 FC C9 90 83
C558:D0 E7 4C 78 C7 A0 00 8C A4
C560:B6 CA 20 30 C5 B1 FD DD CF
C568:57 CA F0 02 E8 60 C8 E8 D3
C570:C0 03 D0 F1 A0 00 A9 F0 9F
C578:20 88 C8 EE B6 CA AD B6 31
C580:CA C9 03 D0 E0 A2 00 60 43
C588:20 30 C5 98 C9 00 D0 08 6A
C590:A9 01 20 94 C8 4C 9B C5 F2
C598:20 88 C8 A0 00 8C B6 CA E3
C5A0:BD 7B CA 91 FD E8 C8 C0 42
C5A8:03 D0 F5 A0 00 A9 F0 20 5B
C5B0:88 C8 EE B6 CA AD B6 CA 41
C5B8:C9 02 D0 E4 60 A2 00 20 BF
C5C0:5D C5 E0 00 F0 01 60 A2 77
C5C8:00 A0 01 4C 88 C5 A2 09 0B
C5D0:20 5D C5 E0 00 F0 01 60 B0
C5D8:A2 06 A0 00 4C 88 C5 A2 FD
C5E0:12 20 5D C5 E0 00 F0 01 6F
C5E8:60 A2 0C A0 F1 4C 88 C5 70
C5F0:A2 1B 20 5D C5 E0 00 F0 11
C5F8:01 60 A2 12 A0 EF 4C 88 78
C600:C5 A2 00 A9 BF 9D AF CA 52
C608:E8 E0 05 D0 F6 A9 01 8D DD
C610:21 D0 A9 93 20 D2 FF A2 BF
C618:00 8E 20 D0 8E 21 D0 A0 95
C620:00 A9 40 9D AF 04 18 69 21
C628:01 E8 C8 C0 0A D0 F4 A8 BB
C630:8A 18 69 1E AA 98 A0 00 11
C638:C9 72 D0 E7 84 FB A9 00 47
C640:8D B4 CA A9 1E 8D 18 D0 DD
C648:A9 80 8D B5 CA A9 3A 85 CE
C650:FC A2 00 A9 AF 85 FD A9 D8
C658:04 85 FE 20 52 C8 A9 00 34
C660:9D 00 39 A9 FF 9D 00 3D 32
C668:E8 E0 08 D0 F1 20 E4 FF 8A
C670:C9 85 D0 13 A2 00 A9 FF F7
C678:9D 00 3A 9D 00 3B E8 D0 85
C680:F7 20 1D C8 4C 6D C6 C9 B1
C688:86 D0 06 A2 00 8A 4C 78 B3
C690:C6 C9 0D D0 09 20 52 C8 D8
C698:20 1D C8 4C CA C4 20 52 57
C6A0:C8 A0 00 AE 00 DC 8A 29 57
C6A8:01 D0 21 CE B4 CA AD B4 DC
C6B0:CA C9 FF D0 17 A9 50 20 43
C6B8:76 C8 A9 28 20 94 C8 A9 F9
C6C0:07 8D B4 CA B1 FD C9 20 B1
C6C8:D0 02 A2 FD 8A 29 02 D0 41
C6D0:24 EE B4 CA AD B4 CA C9 0F
C6D8:08 D0 1A A9 50 20 6A C8 1D
C6E0:A9 28 20 88 C8 A9 00 8D 54
C6E8:B4 CA B1 FD C9 20 D0 05 0F
C6F0:A2 FE 4C A6 C6 8A 29 04 3A
C6F8:D0 21 0E B5 CA AD B5 CA 97
C700:C9 00 D0 17 A9 08 20 76 24
C708:C8 A9 01 20 94 C8 A9 01 A4
C710:8D B5 CA B1 FD C9 20 D0 70
C718:02 A2 F7 8A 29 08 D0 24 28
C720:4E B5 CA AD B5 CA C9 00 E4
C728:D0 1A A9 08 20 6A C8 A9 42
C730:01 20 88 C8 A9 80 8D B5 06
C738:CA B1 FD C9 20 D0 05 A2 E6
C740:FB 4C F5 C6 8A 29 10 D0 F5
C748:29 AC B4 CA AD B5 CA 31 E5
C750:FB F0 15 AD B5 CA 49 FF 03
C758:8D B6 CA B1 FB 2D B6 CA 9D
C760:91 FB 20 3A C8 4C 72 C7 83
C768:B1 FB 0D B5 CA 91 FB 20 81
C770:3A C8 20 52 C8 4C 6D C6 91
C778:A9 00 85 FB A9 40 85 FC A3
C780:A0 01 B1 FB C9 A0 D0 51 5A
C788:A0 03 B1 FB C9 20 D0 03 92
C790:4C E7 C7 A9 01 20 76 C8 12
C798:A0 00 B1 FB C9 20 D0 08 E6
C7A0:A9 01 20 6A C8 4C E7 C7 FE
C7A8:A9 EF 20 76 C8 A0 01 B1 F0
C7B0:FB C9 20 D0 08 A9 F0 20 AA
C7B8:6A C8 4C FA C7 E6 FC A9 66
C7C0:E0 20 6A C8 A0 01 B1 FB 0B
C7C8:C9 20 D0 08 A9 F0 20 76 A7
C7D0:C8 4C FA C7 A9 F0 20 76 7B
C7D8:C8 A9 03 20 6A C8 A5 FC 58
C7E0:C9 90 90 9C 4C 00 C0 A9 E2
C7E8:F0 20 76 C8 A0 01 B1 FB BC
C7F0:AA A9 F0 20 6A C8 E0 D7 70
C7F8:F0 DF A0 01 A9 D7 91 FB E8
C800:4C D9 C7 A0 00 84 FB A9 E4
C808:80 85 FC A9 51 91 FB A9 E7
C810:01 20 6A C8 A5 FC C9 A0 59
C818:D0 F1 4C 4E C4 A9 FF 8D 57
C820:29 3A 8D 2C 3A 8D 6B 3B 63
C828:8D 6E 3B A9 00 8D 2A 3A E2
C830:8D 2B 3A 8D 6C 3B 8D 6D 4C
C838:3B 60 A9 14 8D 01 D4 8D 9D
C840:00 D4 A9 21 8D 04 D4 20 94
C848:5F C8 A9 00 8D 04 D4 4C 63
C850:5F C8 AC B4 CA B1 FB 4D 07
C858:B5 CA 91 FB 20 A6 C8 A2 39
C860:00 A0 EB E8 D0 FD C8 D0 07
C868:FA 60 18 65 FB 85 FB A5 7C
C870:FC 69 00 85 FC 60 8D BB 73
C878:CA A5 FB 38 ED BB CA 85 55
C880:FB A5 FC E9 00 85 FC 60 28
C888:18 65 FD 85 FD A5 FE 69 85
C890:00 85 FE 60 8D BB CA A5 FF
C898:FD 38 ED BB CA 85 FD A5 BE
C8A0:FE E9 00 85 FE 60 A5 FD 47
C8A8:8D B6 CA A5 FE 8D B7 CA CA
C8B0:A9 F0 85 FD A9 05 85 FE 4F
C8B8:A0 00 A2 00 B1 FB 0A 90 11
C8C0:06 48 A9 A0 4C CA C8 48 0E
C8C8:A9 20 8D B8 CA 8C B9 CA 3B
C8D0:8A A8 AD B8 CA 91 FD AC 58
C8D8:B9 CA 68 E8 E0 08 D0 DE 3D
C8E0:A9 28 20 88 C8 C8 C0 08 D0
C8E8:D0 D0 AD B6 CA 85 FD AD 4E
C8F0:B7 CA 85 FE 60 A2 00 A9 E8
C8F8:15 8D 18 D0 86 C6 A9 01 2C
C900:8D 20 D0 8D 21 D0 BD DE FB
C908:C9 20 D2 FF E8 E0 79 D0 71
C910:F5 20 E4 FF C9 31 D0 03 FA
C918:4C 2F C0 C9 32 D0 03 4C 79
C920:01 C6 C9 33 F0 12 C9 34 E9
C928:F0 28 C9 35 F0 24 AD 00 3E
C930:DC 29 10 D0 DC 4C 2F C0 C2
C938:20 86 C9 F0 B8 A9 00 20 52
C940:D5 FF A2 00 BD 97 3B 9D 73
C948:AF CA E8 E0 05 D0 F5 4C 35
C950:0D C6 8D B6 CA A2 00 BD D7
C958:AF CA A8 AD B6 CA C9 34 0F
C960:D0 02 A0 BF 98 9D 97 3B 92
C968:E8 E0 05 D0 EA 20 86 C9 05
C970:F0 83 A9 3A 85 FC A9 00 A9
C978:85 FB A9 FB A0 3B A2 9D 97
C980:20 D8 FF 4C F5 C8 A9 08 4D
C988:AA A0 FF 20 BA FF A2 00 B6
C990:8E 21 D0 BD D1 C9 20 D2 72
C998:FF E8 E0 0D D0 F5 A0 00 F2
C9A0:8C B6 CA 20 E4 FF F0 F8 85
C9A8:AC B6 CA C9 0D F0 15 C9 56
C9B0:14 D0 05 C0 00 F0 E9 88 4F
C9B8:99 CA CA 20 D2 FF C8 C0 10
C9C0:0E D0 DD 88 98 C0 00 D0 6C
C9C8:01 60 A2 CA A0 CA 4C BD 7C
C9D0:FF 93 9F 46 49 4C 45 4E F5
C9D8:41 4D 45 3F 11 0D 93 11 F1
C9E0:11 1C 45 4E 54 45 52 20 0E
C9E8:43 48 4F 49 43 45 20 31 4F
C9F0:2D 34 0D 11 31 2E 20 52 AF
C9F8:41 43 45 0D 11 1D 1D 32 E0
CA00:2E 20 45 44 49 54 20 54 D1
CA08:52 41 43 4B 0D 11 1D 1D 38
CA10:1D 1D 33 2E 20 4C 4F 41 D6
CA18:44 20 54 52 41 43 4B 0D 42
CA20:11 1D 1D 1D 1D 1D 1D 34 C6
CA28:2E 20 53 41 56 45 20 54 B7
CA30:52 41 43 4B 0D 11 1D 1D 60
CA38:1D 1D 1D 1D 1D 1D 35 2E 0F
CA40:20 53 41 56 45 20 54 52 ED
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CA48:41 43 4B 20 26 20 46 41 3A
CA50:53 54 20 54 49 4D 45 A0 98
CA58:20 20 A0 20 20 A0 A0 A0 81
CA60:20 20 A0 20 20 A0 A0 A0 89
CA68:A0 A0 A0 A0 A0 20 20 A0 FA
CA70:20 20 A0 A0 A0 20 20 A0 A2
CA78:20 20 A0 DF 20 20 A0 A0 9B
CA80:DF 20 20 E9 E9 A0 A0 A0 64
CA88:A0 69 69 20 20 5F A0 A0 58
CA90:20 20 5F F0 EF 01 F1 F0 91
CA98:EF 01 F1 01 01 00 00 00 BC
CAA0:00 01 01 7B 7C 7D 8D 7D C0
CAA8:6D 3B 3C 3D CD BD AD BF 9F
CAB0:BF BF BF BF 00 00 00 00 0A
CAR8:00 00 00 00 00 00 00 00 4E
CAC0:00 00 00 00 00 00 00 00 56
CAC8:00 00 00 00 00 00 00 00 5E
```

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See instructions in article on page 80 before typing in.

```
C000:A9 93 20 D2 FF 20 80 C1 AF
C008:A9 4C 85 7C A9 27 85 7D 5C
C010:A9 C0 85 7E A9 EA 85 7F B2
C018:A2 00 BD 38 C3 F0 07 20 36
C020:D2 FF E8 4C 1A C0 60 CD 4F
C028:34 C3 F0 08 C9 3A B0 03 EE
C030:4C 80 00 60 A2 00 BD 35 C3
C038:C3 8D 20 D0 E8 BD 35 C3 7C
C040:8D 21 D0 E8 BD 35 C3 8D 51
C048:86 02 A2 00 BD 3D C2 F0 3B
C050:07 20 D2 FF E8 4C 4C C0 89
C058:20 E4 FF F0 FB C9 31 F0 8C
C060:1F C9 32 F0 1E C9 33 F0 A8
C068:1D C9 34 F0 1C C9 35 F0 E3
C070:1B C9 42 F0 1A C9 53 F0 D8
C078:22 C9 43 F0 2A 4C 58 C0 E8
C080:4C B3 C0 4C BE C0 4C BA 3E
C088:C1 4C F0 C1 4C 78 C1 EE EE
C090:20 D0 AD 20 D0 8D 35 C3 F8
C098:4C 58 C0 EE 21 D0 AD 21 26
C0A0:D0 8D 36 C3 4C 58 C0 EE 25
C0A8:86 02 AD 86 02 8D 37 C3 84
C0B0:4C 34 C0 20 94 C1 20 E4 50
C0B8:FF F0 FB 4C 34 C0 A9 93 46
C0C0:20 D2 FF 20 94 C1 20 0D 02
C0C8:C1 20 E4 FF F0 FB C9 5F 3A
C0D0:F0 09 8D 90 C3 20 E8 C0 F8
C0D8:4C C9 C0 AD 94 C3 A0 00 DA
C0E0:91 FB 20 80 C1 4C 34 C0 9E
C0E8:AD 94 C3 A0 00 91 FB AD D4
C0F0:90 C3 20 D2 FF 38 20 F0 EE
C0F8:FF 86 FD 84 FE 20 22 C1 A2
C100:A0 00 B1 FB 8D 94 C3 18 28
C108:69 80 91 FB 60 A9 00 85 81
C110:FB A9 04 85 FC A0 00 B1 F0
C118:FB 8D 94 C3 18 69 80 91 C4
C120:FB 60 A5 FE C9 28 90 05 73
C128:38 E9 28 85 FE A9 00 8D CB
C130:91 C3 8D 92 C3 A5 FD 8D 86
C138:93 C3 A0 27 A9 00 18 AD 28
C140:91 C3 6D 93 C3 8D 91 C3 9F
C148:AD 92 C3 69 00 8D 92 C3 75
C150:88 10 EC 18 AD 91 C3 65 DB
C158:FE 8D 91 C3 AD 92 C3 69 D5
C160:00 8D 92 C3 18 AD 92 C3 36
C168:69 04 8D 92 C3 AD 91 C3 38
C170:85 FB AD 92 C3 85 FC 60 23
C178:A9 93 20 D2 FF 4C 74 A4 A5
C180:20 A8 C1 A2 04 B1 FB 91 11
C188:FD C8 D0 F9 E6 FC E6 FE EE
C190:CA 10 F2 60 20 A8 C1 A2 AB
C198:04 B1 FD 91 FB C8 D0 F9 02
C1A0:E6 FC E6 FE CA 10 F2 60 80
C1A8:A9 00 85 FB A8 A9 04 85 EA
C1B0:FC A9 95 85 FD A9 C3 85 CB
C1B8:FE 60 A2 00 BD 6E C3 F0 48
C1C0:07 20 D2 FF E8 4C BC C1 DD
C1C8:20 1A C2 98 A2 4E A0 C3 18
C1D0:20 BD FF A9 00 A2 08 A0 A9
C1D8:00 20 BA FF A9 95 85 FD 68
C1E0:A9 C3 85 FE A9 FD A2 7E D3
C1E8:A0 C7 20 D8 FF 4C 34 C0 9A
C1F0:A2 00 BD 7F C3 F0 07 20 85
C1F8:D2 FF E8 4C F2 C1 20 1A C0
C200:C2 98 A2 4E A0 C3 20 BD 58
C208:FF A9 00 A2 08 A0 FF 20 05
C210:BA FF A9 00 20 D5 FF 4C CC
C218:34 C0 A2 00 BD 5E C3 F0 1C
C220:07 20 D2 FF E8 4C 1C C2 FE
C228:A0 00 20 CF FF C9 0D F0 31
C230:0B 99 4E C3 C8 C0 10 F0 02
C238:03 4C 2A C2 60 93 12 20 59
C240:20 20 20 20 20 20 20 20 C5
C248:20 20 20 20 20 20 4E 4F 59
C250:54 45 50 41 44 20 36 34 B2
C258:20 20 20 20 20 20 20 20 DD
C260:20 20 20 20 20 20 20 92 58
C268:0D 0D 0D 0D 20 20 20 20 0C
C270:20 20 20 20 20 20 20 20 F5
C278:20 20 31 2D 56 49 45 57 C8
C280:20 4E 4F 54 45 53 0D 20 8A
C288:20 20 20 20 20 20 20 20 0E
C290:20 20 20 20 20 32 2D 45 9D
C298:4E 54 45 52 20 4E 4F 54 55
C2A0:45 53 0D 20 20 20 20 20 23
C2A8:20 20 20 20 20 20 20 20 2E
C2B0:20 33 2D 53 41 56 45 20 FB
C2B8:4E 4F 54 45 53 0D 20 20 47
C2C0:20 20 20 20 20 20 20 20 46
C2C8:20 20 20 20 34 2D 4C 4F AA
C2D0:41 44 20 4E 4F 54 45 53 9A
C2D8:0D 20 20 20 20 20 20 20 D4
C2E0:20 20 20 20 20 20 20 35 7B
C2E8:2D 45 58 49 54 0D 0D 0D F3
C2F0:0D 20 20 59 4F 55 52 20 33
C2F8:43 48 4F 49 43 45 3F 0D 6B
C300:11 11 11 11 11 11 11 11 87
C308:11 12 28 42 29 4F 52 44 35
C310:45 52 2C 20 28 53 29 43 7A
C318:52 45 45 4E 2C 20 4F 52 7A
C320:20 28 43 29 48 41 52 41 E9
C328:43 54 45 52 20 43 4F 4C 2D
C330:4F 52 92 00 5F 00 00 01 42
C338:4E 4F 54 45 50 41 44 20 C9
C340:36 34 20 41 43 54 49 56 5C
C348:41 54 45 44 0D 00 00 00 DA
C350:00 00 00 00 00 00 00 00 D7
C358:00 00 00 00 00 00 45 4E B8
C360:54 45 52 20 46 49 4C 45 E4
C368:4E 41 4D 45 3E 00 93 12 90
C370:20 53 41 56 45 20 46 49 EA
C378:4C 45 20 92 0D 0D 00 93 D4
C380:12 20 4C 4F 41 44 20 46 39
C388:49 4C 45 20 92 0D 0D 00 55
C390:00 00 00 00 00 00 00 00 18
```

Sprite Killer

See instructions in article on page 79 before typing in.

```
0801:0B 08 0A 00 9E 32 30 36 2E
0809:32 00 00 00 00 A0 00 B9 6E
0811:28 09 99 00 CF C8 D0 F7 E5
0819:84 FD A2 28 86 FB A2 09 34
0821:E8 86 FC A9 DC 85 FE 78 F4
0829:A9 30 85 01 A2 04 B1 FB 5F
0831:91 FD C8 D0 F9 E6 FC E6 FB
0839:FE CA D0 F2 A9 33 85 01 EA
0841:B9 00 D0 99 00 D0 B9 00 98
0849:D1 99 00 D1 A9 77 99 00 24
0851:D8 99 00 D9 99 00 DA 99 ED
0859:00 DB A9 20 99 00 D4 99 A7
0861:00 D5 99 00 D6 99 00 D7 0F
0869:C8 D0 D5 98 18 69 48 99 E6
0871:F8 D7 C8 C0 08 D0 F4 A0 27
0879:00 B9 BA 08 99 1D D5 C8 85
0881:C0 1D D0 F5 A0 00 B9 D7 03
0889:08 99 4A D5 C8 C0 13 D0 EA
0891:F5 A0 00 A2 30 8A 99 A2 70
0899:D4 98 18 69 05 A8 E8 E0 51
08A1:38 D0 F2 A9 37 85 01 58 25
08A9:20 00 CF A0 00 B9 EA 08 92
08B1:F0 06 20 D2 FF C8 D0 F5 A7
08B9:60 10 12 05 13 13 20 30 E5
08C1:2D 37 20 14 0F 20 04 09 85
08C9:13 01 02 0C 05 20 01 20 6F
08D1:13 10 12 09 14 05 0F 12 27
08D9:20 1B 12 05 14 15 12 0E 7A
08E1:1D 20 14 0F 20 05 18 09 4A
08E9:14 0D 53 50 52 49 54 45 5C
08F1:20 4B 49 4C 4C 45 52 20 0F
08F9:49 53 20 4E 4F 57 20 41 C5
0901:43 54 49 56 45 2E 0D 54 A9
0909:4F 20 4B 49 4C 4C 20 53 EF
0911:50 52 49 54 45 53 2C 20 3E
0919:54 41 50 20 52 45 53 54 54
0921:4F 52 45 2E 0D 0D 00 78 10
0929:20 8A FF AD 26 03 8D 53 74
0931:CF AD 27 03 8D 54 CF AD B6
0939:00 03 8D 44 CF AD 01 03 3C
0941:8D 45 CF A9 37 8D 00 03 F2
0949:A9 CF 8D 01 03 AD 18 03 E7
0951:8D A2 CF AD 19 03 8D A3 3B
0959:CF 4E E6 CF 58 60 48 A9 3F
0961:46 8D 26 03 A9 CF 8D 27 BD
0969:03 68 4C 00 00 48 A9 55 6A
0971:8D 18 03 A9 CF 8D 19 03 35
0979:68 4C 00 00 78 48 2C E6 F6
0981:CF 30 44 38 6E E6 CF 8A CC
0989:48 98 48 A5 01 48 A9 36 FB
0991:85 01 A9 00 8D 00 DC AA AC
0999:A8 AD 01 DC EA CD 01 DC C6
09A1:D0 F7 C9 FF D0 12 EE E7 E7
09A9:CF C8 D0 FA E8 D0 F7 20 3A
09B1:A4 CF 20 00 10 20 A4 CF 28
09B9:A9 7F 8D 00 DC 68 85 01 C6
09C1:68 A8 68 AA 4E E6 CF 68 FF
09C9:4C 00 00 78 A9 10 8D BF F1
09D1:CF 8D C8 CF A9 DC 8D C5 E6
09D9:CF 8D CE CF A2 04 A0 00 74
09E1:A9 30 85 01 B9 00 10 8D 11
09E9:E7 CF B9 00 DA 99 00 10 68
09F1:AD E7 CF 99 00 DA C8 D0 36
09F9:EB EE BF CF EE C5 CF EE CF
0A01:C8 CF EE CE CF CA D0 DC 60
0A09:A9 36 85 01 60 76 00 AA C7
0A11:AA AA AA AA AA AA AA AA 25
0A19:AA AA AA AA AA AA AA AA 2D
0A21:AA AA AA AA AA AA AA A5 30
0A29:FB 8D 7E 10 A5 FC 8D 7F 2B
0A31:10 A5 FD 8D 80 10 A5 FE DD
0A39:8D 81 10 20 9F 10 AD 7E 8F
0A41:10 85 FB AD 7F 10 85 FC 5D
0A49:AD 80 10 85 FD AD 81 10 68
0A51:85 FE AD 1E D0 AD 1F D0 CB
0A59:A9 8F 8D 19 D0 AD 0D DC 9D
0A61:A9 00 8D 00 DC AD 01 DC 78
0A69:EA CD 01 DC D0 F7 C9 FF 4E
0A71:D0 F3 60 30 31 32 33 34 E6
0A79:35 36 37 38 39 41 42 43 B6
0A81:44 45 46 30 31 32 33 34 C1
0A89:35 36 37 38 39 41 42 43 C6
0A91:44 45 46 30 31 32 33 34 D1
0A99:35 36 37 38 39 41 42 43 D6
0AA1:44 45 46 7E 0A AA AA AA D4
0AA9:AA AA AA AA AA FE FD FB 07
0AB1:F7 EF DF BF 7F 20 3A 48 EE
0AB9:3A 70 3A 98 3A C0 3A E8 0A
0AC1:3A 10 3A 38 3A C0 AD 00 F1
0AC9:DD 49 03 0A 0A 0A 0A 0A B6
0AD1:0A 8D 7C 10 AD 18 D0 29 77
0AD9:F0 4A 4A 18 6D 7C 10 8D CE
0AE1:7D 10 A9 30 85 01 A0 00 62
0AE9:8C 82 10 8C 83 10 A9 D2 32
0AF1:8D 84 10 A0 00 84 FC A9 AF
0AF9:F8 85 FD AD 7D 10 18 69 4C
0B01:03 85 FE AC 82 10 B1 FD 5A
0B09:A2 05 0A 26 FC CA 10 FA 83
0B11:85 FB 18 A5 FC 6D 7C 10 EC
0B19:85 FC A0 3F AD 83 10 85 5A
0B21:FD AD 84 10 85 FE B1 FB BA
0B29:91 FD 88 10 F9 AD 83 10 37
0B31:18 69 40 8D 83 10 90 03 0F
0B39:EE 84 10 EE 82 10 AD 82 0B
0B41:10 C9 08 F0 03 4C CC 10 D4
0B49:A9 36 85 01 A0 2E B9 00 B3
0B51:D0 99 4C 10 88 10 F7 A9 DE
0B59:1B 8D 11 D0 A9 08 8D 16 2E
```

```
ØB61:DØ AØ ØØ 8C 17 DØ 8C 1D Ø3
ØB69:DØ A9 54 8D 18 DØ AD ØØ 15
ØB71:DD 8D 85 1Ø 29 FC 8D ØØ E3
ØB79:DD AØ 1Ø B9 8E 1Ø 99 ØØ 2C
ØB81:DØ 88 1Ø F7 2Ø C2 11 2Ø F1
ØB89:A3 11 AE A2 11 EØ Ø8 FØ C2
ØB91:11 BØ F4 BD 86 1Ø 2D 61 Ø7
ØB99:1Ø 8D 61 1Ø 8D 15 DØ 4C F6
ØBA1:6Ø 11 2Ø C2 11 AØ 2E B9 7D
ØBA9:4C 1Ø 99 ØØ DØ 88 1Ø F7 DD
ØBB1:AD 85 1Ø 8D ØØ DD 6Ø EF Ø3
ØBB9:7F 7F FD FD FB FB F7 FE CD
ØBC1:F7 FE F7 FE F7 FE F7 FE 2D
ØBC9:FD ØØ AØ ØØ B9 9Ø 11 8D B2
ØBD1:ØØ DC AD Ø1 DC EA CD Ø1 14
ØBD9:DC DØ F7 D9 99 11 FØ Ø5 27
ØBE1:C8 CØ Ø9 DØ E7 8C A2 11 82
ØBE9:6Ø AØ ØØ 84 FB A9 D8 85 5E
ØBF1:FC B1 FB 48 A9 3Ø 85 Ø1 11
ØBF9:B1 FB AA 68 91 FB A9 36 C9
ØC01:85 Ø1 8A 91 FB C8 DØ E9 15
ØC09:E6 FC A6 FC EØ DC DØ E1 76
ØC11:6Ø ØØ ØØ ØØ ØØ ØØ ØØ ØØ 59
```

Supratechnic

See instructions in article on page 81 before typing in.

Program 1: Supratechnic

```
0801:0B 08 0A 00 9E 32 30 36 2E
0809:31 00 00 00 A9 0E 85 2C 6E
0811:68 68 A9 FF 85 FB A9 00 14
0819:8D 00 0E 85 FC 20 24 08 C2
0821:4C 44 A6 78 AD 14 03 C9 52
0829:31 D0 38 A9 09 8D E8 08 FF
0831:AD 93 08 85 FB AD 14 03 18
0839:85 03 AD 15 03 85 04 A9 B3
0841:9C 8D 14 03 A9 08 8D 15 53
0849:03 A9 01 8D 19 D0 8D 1A 7F
0851:D0 AD 11 D0 29 7F 8D 11 D7
0859:D0 A9 00 8D 12 D0 A9 7F BB
0861:8D 0D DC 58 60 78 A5 03 CF
0869:8D 14 03 A5 04 8D 15 03 83
0871:AD 11 D0 09 80 8D 11 D0 74
0879:A5 FB 8D 93 08 A9 FF 85 B2
0881:FB 20 5E FF 58 60 4C 24 64
0889:08 4C 66 08 4C A8 0A 4C 63
0891:EB 0A 00 A9 45 8D 12 D0 0A
0899:4C 81 EA AD 19 D0 29 7F 46
08A1:D0 03 6C 03 00 8D 19 D0 D1
08A9:AD 12 D0 C9 F7 90 6F A5 52
08B1:FB F0 E0 C9 01 F0 77 AD 1D
08B9:FF 3F 48 AD 11 D0 29 F7 93
08C1:8D 11 D0 AD 21 D0 48 A2 51
08C9:FA EC 12 D0 D0 FB A0 06 9F
08D1:EA 88 D0 FC EA EA A5 FD AF
08D9:8D 21 D0 CE E8 08 4C E7 E7
08E1:08 EC 12 D0 D0 FB BD 09 7B
08E9:0B 8D FF 3F E8 E0 07 F0 A0
08F1:1F E0 0F F0 15 E0 33 D0 1E
08F9:E8 A2 04 EA CA D0 FC 68 52
0901:8D 21 D0 68 8D FF 3F 4C F9
0909:94 08 EE E8 08 4C E2 08 13
0911:A0 DA B9 00 0B 8D FF 3F 2F
0919:C8 D0 F7 4C E2 08 AD 11 2B
0921:D0 09 08 8D 11 D0 A9 F7 CE
0929:8D 12 D0 4C E6 09 AD 11 2D
0931:D0 29 F7 8D 11 D0 AD FF F4
0939:3F 48 A9 FA CD 12 D0 D0 0B
0941:FB A2 06 EA CA D0 FC AD AA
0949:21 D0 48 A5 FD 8D 21 D0 BC
0951:A9 00 8D FF 3F A9 32 CD BC
0959:12 D0 D0 FB A2 07 EA CA 54
0961:D0 FC 4C 00 09 AC 0F 0D CA
0969:A2 07 BD 07 0D 9D 08 0D B2
0971:CA E0 FF D0 F5 BD 07 0C EE
0979:9D 08 0C CA D0 F7 8C 08 12
0981:0C 20 A7 09 6C 03 00 AC 43
0989:08 0C A2 00 BD 09 0C 9D BE
0991:08 0C E8 D0 F7 BD 09 0D AA
0999:9D 08 0D E8 E0 08 D0 F5 6B
09A1:8C 0F 0D 4C 82 09 A2 FB 9D
09A9:A0 00 B9 08 0C 9D 08 0B B5
09B1:C8 E8 E0 07 D0 F4 A2 D8 67
09B9:D0 04 B9 08 0C C8 48 A9 AA
09C1:05 85 02 68 9D 00 0B E8 6A
09C9:C6 02 D0 F8 E0 00 D0 EA FC
09D1:A2 07 B9 08 0C 9D 08 0B A0
09D9:C8 E8 E0 34 D0 F4 AD 08 A7
09E1:0C 8D 02 0C 60 A5 F7 C9 B1
09E9:03 D0 06 20 31 0A 4C A5 64
09F1:0A C9 02 F0 0F C6 FE F0 4D
09F9:08 20 31 0A A6 FC 4C 1E BE
0A01:0A 4C 12 0A C6 FE D0 06 E9
0A09:20 31 0A 4C 12 0A 6C 03 14
0A11:00 A6 FC 8A 29 01 D0 12 18
0A19:8A 29 02 D0 10 8A 29 04 0B
0A21:D0 37 8A 29 08 D0 5B 6C F5
0A29:03 00 4C 88 09 4C 66 09 20
0A31:A9 03 85 F7 A6 FC 8A 29 72
0A39:01 D0 14 8A 29 02 D0 0F 2F
0A41:8A 29 04 D0 0F 8A 29 08 6F
0A49:D0 0A A5 F7 85 FE 60 C6 2C
0A51:F7 4C 41 0A C6 F7 4C 4B 37
0A59:0A A2 00 BD 08 0C 29 01 BA
0A61:D0 03 18 90 01 38 7E 08 98
0A69:0C E8 D0 EF BD 08 0D 29 28
0A71:01 D0 03 18 90 01 38 7E 93
0A79:08 0D E8 E0 08 D0 ED 4C AB
0A81:82 09 A2 00 BD 08 0C 30 C3
0A89:03 18 90 01 38 3E 08 0C 1E
0A91:E8 D0 F1 BD 08 0D 30 03 40
0A99:18 90 01 38 3E 08 0D E8 96
0AA1:E0 08 D0 EF 4C 82 09 AD 6D
0AA9:86 02 8D E9 0A A9 00 8D 56
0AB1:C4 0A 8D 86 02 20 FC 0A 59
0AB9:A9 04 8D C5 0A A0 89 98 30
0AC1:A2 00 8D 00 04 EE C4 0A 48
0AC9:D0 03 EE C5 0A E8 E0 28 1F
0AD1:D0 F0 C8 C0 A2 D0 E8 A9 83
0AD9:12 8D 18 D0 AD 21 D0 8D 8B
0AE1:EA 0A A5 FD 8D 21 D0 60 75
0AE9:00 00 AD E9 0A 8D 86 02 E7
0AF1:AD EA 0A 8D 21 D0 A9 15 66
0AF9:8D 18 D0 A9 93 4C D2 FF 03
```

Program 2: Supratechnic Demo

```
HE 10 REM COPYRIGHT 1988 COMPU
      TE! PUBLICATIONS, INC. -
       ALL RIGHTS RESERVED
XD 20 POKE56,136:CLR:X=RND(-TI
      )
JS 30 POKE53280,0:POKE53281,0:
      PRINT"{CLR}{WHT}{4 DOWN}
      PLEASE WAIT..."
GB 40 X=0:FORI=1TO380:READA:X=
      X+A:NEXT:IFX<>50225THENP
      RINT"DATA ERROR.":STOP
XF 50 RESTORE:SYS2186
HX 60 DIMX(10),Y(10),C(16)
CP 70 FORI=0TO217:READA:POKE49
      148+I,A:NEXT
MP 80 SYS49298:REM MOVE CHARAC
      TER ROM TO RAM FOR SPRIT
      E CONVERSIONS
RA 90 SYS2183:POKE251,0
CE 100 RESTORE:GOTO510
AB 110 FORI=0TO8*64:POKE8192+I
       ,0:NEXT
DG 120 FORI=0TO7:POKE53287+I,1
       :POKE2040+I,128+I:NEXT
SA 130 POKE53277,255:POKE53269
       ,0:POKE53271,0
BM 140 PRINT"{CLR}":POKE251,1:
       POKE252,0:POKE253,0
HR 150 A$="WELCOME{2 SPACES}TO
        SUPRATECHNIC":T=1:GOSU
       B1130
SH 160 FORY=1TO1500:NEXT
KB 170 FORT=0TO200:FORF=1TO5:N
       EXT
RQ 180 SYS49342:NEXT
CR 190 FORF=1TO1500:NEXT
QJ 200 POKE53269,0
JM 210 A$="FULL{2 SPACES}GRAPH
       IC{2 SPACES}MODE":T=2:G
       OSUB1130
HP 220 T=0:POKE251,2:POKE252,0
       :POKE253,0
XC 230 SYS2189
RB 240 T=T+1:IFT=5THEN310
PE 250 GOSUB1070
JD 260 GOSUB1200
EC 270 RESTORE:FORI=0TO2:READE
       :POKE252,E
XQ 280 FORJ=0TO500:NEXT:NEXT
JX 290 READE:POKE252,E
FF 300 GOTO240
MH 310 POKE252,2
RS 320 FORT=0TO82:GOSUB1230:NE
       XT
FG 330 POKE53269,252
DX 340 FORT=0TO28:GOSUB1230:NE
       XT
JK 350 POKE53269,224
PR 360 FORT=0TO28:GOSUB1230:NE
       XT
QE 370 POKE53269,0
DJ 380 FORT=0TO1000:NEXT
EP 390 POKE252,0:POKE251,1:POK
       E253,0:SYS2192
GH 400 A$="SPRITEMODE":T=3:GOS
       UB1130
CF 410 FORI=0TO500:NEXT
ED 420 FORG=1TO6
QH 430 GOSUB1210:FORI=0TO500:N
       EXT:NEXT
MF 500 POKE252,0:POKE251,0:POK
       E253,0:SYS2192:POKE5326
       9,0:GOTO140
CX 510 DATA5,6,10,9
BC 520 REM EXTENDED ML ROUTINE
       S
HP 530 DATA169,8,141,19,192,16
       9,12,141,20
KP 540 DATA192,172,60,3,162,0,
       189,61,3,141
PR 550 DATA8,12,238,19,192,208
       ,3,238,20
SS 560 DATA192,173,19,192,201,
       16,240,7,232
PD 570 DATA136,208,231,76,10,1
       92,173,20
SM 580 DATA192,201,13,208,242,
       96
PH 590 DATA169,0,170,141,104,1
       92,169,32
QS 600 DATA141,105,192,169,3,1
       33,167,169
DQ 610 DATA0,133,169,189,60,3,
       133,168,138
CH 620 DATA72,24,38,168,38,169
       ,38,168,38,169
PD 630 DATA38,168,38,169,24,16
       5,169,105,136,133,169
PP 640 DATA162,0,160,0,177,168
       ,157,194,33
HD 650 DATA232,232,232,200,192
       ,8,208,243,104,170,232
SQ 660 DATA224,24,208,1,96,238
       ,104,192,198
EQ 670 DATA167,208,193,24,173,
       104,192,105,61,141
RB 680 DATA104,192,144,3,238,1
       05,192,76,62
RQ 690 DATA192,120,165,1,72,16
       9,49,133,1,160,0
SX 700 DATA132,170,132,168,169
       ,208,133,169
MB 710 DATA169,128,133,171,177
       ,168,145,170,200,208
MR 720 DATA249,230,169,230,171
       ,165,169,201
AM 730 DATA224,208,239,104,133
       ,1,88,96
KP 740 DATA162,1,222,0,208,232
       ,232,224,17
```

```
BK 750 DATA208,247,96,162,1,25
       4,0,208,232
BR 760 DATA232,224,17,208,247,
       96
GM 770 REM FULL GRAPHIC MODE G
       RAPHIC DATA
FH 780 X(1)=PEEK(61):Y(1)=PEEK
       (62)
QD 790 DATA252,248,240,224,192
       ,128,1,3
BP 800 DATA7,15,31,63,255,255,
       170,85
CP 810 DATA170,85,170,85,255,2
       55,-1
SD 820 X(2)=PEEK(61):Y(2)=PEEK
       (62)
BK 830 DATA255,255,0,0,255,255
       ,204,51
CH 840 DATA204,51,255,255,24,2
       4,24,24
MD 850 DATA255,255,204,51,204,
       51,-1
EX 860 X(3)=PEEK(61):Y(3)=PEEK
       (62)
CQ 870 DATA240,240,240,240,15,
       15,15,15
FP 880 DATA255,255,255,204,51,
       204,51
AP 890 DATA204,51,204,51,255,2
       55,255
GP 900 DATA170,85,170,85,170,8
       5,170,85
SS 910 DATA255,255,255,-1
FJ 920 X(4)=PEEK(61):Y(4)=PEEK
       (62)
SB 930 DATA255,255,255,3,6,12,
       24,48,96
XD 940 DATA192,192,96,48,24,12
       ,6,3
JG 950 DATA255,255,255,170,85,
       170,85
AF 960 DATA204,51,204,51,204,1
       70,85
DM 970 DATA170,85,-1
EF 980 REM SPRITE POSITIONS
AD 990 X(5)=PEEK(61):Y(5)=PEEK
       (62)
HK 1000 DATA128,100,176,100,22
        4,100,168,130,88,160,1
        36,160,184,160,232,160
CB 1010 X(6)=PEEK(61):Y(6)=PEE
        K(62)
AE 1020 DATA160,100,208,100,13
        2,130,180,130,228,130,
        160,160,208,160,0,100
ES 1030 X(7)=PEEK(61):Y(7)=PEE
        K(62)
KP 1040 DATA136,35,184,35,152,
        0,200,0,0,100,0,100,0,
        100,0,100
RM 1050 GOTO1110
XP 1060 REM QUICK FILL GRAPHIC
         BUFFER WITH DATA
GK 1070 POKE65,X(T):POKE66,Y(T
        ):I=0
XQ 1080 READA:IFA=-1THEN1100
SG 1090 POKE829+I,A:I=I+1:GOTO
        1080
MX 1100 POKE828,I:I=PEEK(252):
        POKE252,0
CP 1110 SYS49152:POKE252,I:RET
        URN
FQ 1120 REM CONVERT STRING TO
        {SPACE}SPRITES AND SET
         POSITION FROM DATA
FJ 1130 POKE53269,0
MC 1140 IFLEN(A$)<24THENA$=A$+
        " ":GOTO1140
FB 1150 FORI=1TO24:POKE827+I,A
        SC(MID$(A$,I,1)):NEXT
GK 1160 SYS49203
GG 1170 POKE65,X(T+4):POKE66,Y
        (T+4)
AF 1180 FORI=0TO15:READC(I):PO
        KE53248+I,C(I):NEXT
JB 1190 POKE53269,255:RETURN
QD 1200 A=INT(RND(1)*14)+2:POK
        E253,A:POKE53281,A:RET
        URN
JD 1210 A=INT(RND(1)*14)+2:POK
        E253,A:A=INT(RND(1)*14
        )+2:POKE53281,A:RETURN
QF 1220 REM DECREASE Y ON ALL
        {SPACE}SPRITES
QG 1230 SYS49342:FORY=0TO10:NE
        XT:RETURN
```

Program 3: Supratechnic Boot

```
HE 10 REM COPYRIGHT 1988 COMPU
      TE! PUBLICATIONS, INC. -
       ALL RIGHTS RESERVED
RH 20 PRINT"{CLR}{3 SPACES}COP
      YRIGHT 1988 COMPUTE! PUB
      ., INC."
JS 30 PRINTTAB(11)"ALL RIGHTS
      {SPACE}RESERVED":FORI=1T
      O2000:NEXT
KX 40 A$="SUPRA.DEMO"
HX 50 PRINT"{CLR}{DOWN}"
HR 60 PRINT"LOAD";CHR$(34);"SU
      PRATECHNIC";CHR$(34);",8
      ,1"
FE 70 PRINT"{3 DOWN}"
GQ 80 PRINT"SYS2061:SYS2086"
AJ 90 PRINT:PRINT
QF 100 PRINT"LOAD";CHR$(34);A$
       ;CHR$(34);",8"
AB 110 PRINT"{3 DOWN}"
QP 120 PRINT"SYS2083:RUN"
ED 130 PRINT"{HOME}";
AC 140 POKE198,4
BB 150 FORI=0TO3:POKE631+I,13:
       NEXT
MX 160 END
```

Quolerus

Article on page 55.

Program 1: Quolerus—BASIC Program

```
AJ 10 REM COPYRIGHT 1988 COMPU
      TE! PUBLICATIONS, INC.
      {2 SPACES}ALL RIGHTS RES
      ERVED
EG 20 PRINT"{CLR}{7£}
      {11 SPACES}COPYRIGHT 198
      8":PRINT"{6 SPACES}COMPU
      TE! PUBLICATIONS, INC."
JF 30 PRINT"{9 SPACES}ALL RIGH
      TS RESERVED"
RQ 50 IFL=0THENL=1:LOAD"QUOLER
      US.SPR",8,1
SS 60 IFL=1THENL=2:LOAD"QUOLER
      US.ML",8,1
SX 70 POKE52,32:POKE56,32:CLR:
      GOTO460
DR 80 SH=3:EN=0:WA=2:LE=0:NS=1
      :OC=0:SL=1
SF 90 FORI=53047TO53052:POKEI,
      48:NEXT
EJ 100 POKE53...30,0:POKE53281,0
       :GOTO250
RF 110 V=53248
RP 120 POKEV,250:POKEV+1,200:P
       OKEV+39,1:POKE2040,199
BD 130 POKEV+4,65:POKEV+5,150:
       POKEV+41,5:POKEV+23,4:P
       OKEV+29,4
AQ 140 PRINT"{WHT}{HOME}
       {10 RIGHT}";SH
SS 150 SYS 49152
SS 160 Z=PEEK(53278):Z=PEEK(53
       279)
AD 170 SC$=""
SR 180 FORI=53047TO53052:REM C
       F37-CF3C
EC 190 SC$=SC$+CHR$(PEEK(I))
XR 200 NEXT
QE 210 SC=VAL(SC$):IFSC>=10000
       *NSTHENSH=SH+1:NS=NS+1
HB 220 IFPEEK(53007)=16THENGOT
       O250
GA 230 SH=SH-1:IFSH=0THEN460
RA 240 GOTO110
CF 250 LE=LE+1:POKE53031,0:POK
       E53058,0:REM CF27, CF42
DB 260 IFLE>10THENSL=SL+1:LE=8
       :GOTO320
DK 270 IFLE>7THENSL=3:GOTO290
EQ 280 IFLE>4THENSL=2
FC 290 ONSLGOTO300,310,320
SG 300 WA=2:EN=LE+2:GOTO330
HB 310 WA=4:EN=LE-1:GOTO330
FH 320 WA=6:EN=LE-4
JB 330 FORI=ENTO3STEP-1
PD 340 POKE53031,PEEK(53031)OR
       2↑I:REM CF27
BH 350 NEXT
MP 360 POKE53022,WA:IFEN>=5THE
       NPOKE53058,2↑EN
KF 370 X=1039:Y=55311:C=1:K=0
CQ 380 FORS=1TO25
JA 390 FORI=0TOWA+1
MM 400 POKEX+I,224:POKEY+I,C
EM 410 NEXT
KS 420 X=X+40:Y=Y+40
EF 430 K=K+1:IFK>=3THENK=0:C=C
       +1:IFC>15THENC=1
JR 440 NEXT
HR 450 GOTO110
FF 460 POKE53280,0:POKE53281,0
       :PRINT"{CLR}{DOWN}";
GD 470 PRINT"{CYN}{4 SPACES}
       {RVS}£ £*3{OFF}
       {2 SPACES}{RVS} {OFF}
       {RVS} {OFF} {RVS}£ £*3
       {OFF} {RVS}£{OFF}
       {3 SPACES}{RVS}£ £*3
       {OFF} {RVS}{2 SPACES}
       £*3{OFF} {RVS} {OFF}
       {RVS} {OFF} {RVS}£ £*3
       {OFF}"
QJ 480 PRINT"{4 SPACES}{RVS}
       {OFF} {RVS} {OFF}
       {2 SPACES}{RVS} {OFF}
       {RVS} {OFF} {RVS} {OFF}
        {RVS} {OFF} {RVS}
       {OFF}{3 SPACES}{RVS}
       {OFF}{3 SPACES}{RVS}
       {OFF} {RVS} {OFF} {RVS}
        {OFF} {RVS} {OFF}
       {RVS} {OFF}"
SQ 490 PRINT"{4 SPACES}{RVS}
       {OFF} {RVS} {OFF}
       {2 SPACES}{RVS} {OFF}
       {RVS} {OFF} {RVS} {OFF}
        {RVS} {OFF} {RVS}
       {OFF}{3 SPACES}{RVS}
       {2 SPACES}{OFF}
       {2 SPACES}{RVS}
       {2 SPACES}{OFF}£ {RVS}
        {OFF} {RVS} {OFF} £*3
       {RVS} £*3{OFF}"
QJ 500 PRINT"{4 SPACES}{RVS}
       {OFF}£*3{RVS} {OFF}
       {2 SPACES}{RVS} {OFF}
       {RVS} {OFF} {RVS} {OFF}
        {RVS} {OFF} {RVS}
       {OFF}{3 SPACES}{RVS}
       {OFF}{3 SPACES}{RVS}
       {OFF}£*3{RVS}£*3{OFF}
       {RVS} {OFF} {RVS} {OFF}
       {3 SPACES}{RVS} {OFF}"
PF 510 PRINT"{4 SPACES}£*3
```

```
        {RVS} {OFF}£*3{RVS}£*3
        {OFF} £*3{RVS} {OFF}£
        {SPACE}£*3{RVS} {OFF}£
         £*3{RVS} {OFF}£ £*3
        {RVS} {OFF}£ {RVS}
        {OFF} £*3 £*3{RVS}
        {OFF}£ £*3{RVS} {OFF}
        £"
FP 520  FORS=1TO2500:NEXT
FP 530  PRINT"{2 DOWN}
        {10 RIGHT}QUOLERUS IS B
        ASED ON"
PF 540  PRINT"{13 RIGHT}YAR'S R
        EVENGE"
SG 550  PRINT"{7 RIGHT}COPYRIGH
        T 1981 ATARI CORP."
BX 560  PRINT"{10 RIGHT}WITH PE
        RMISSION FROM"
EK 570  PRINT"{11 RIGHT}ATARI C
        ORPORATION."
RE 580  PRINT"{3 DOWN}
        {13 RIGHT}SCORE:";SC$
JM 590  PRINT"{5 DOWN}{8 RIGHT}
        PRESS TRIGGER TO BEGIN"
DJ 600  IFPEEK(56320)=111THENPR
        INT"{CLR}":RUN80
FG 610  SYS 52016
GS 620  FORS=1TO50:NEXT:GOTO600
```

Program 2: Quolerus—Sprite Data

See instructions in article on page 55 before typing in.

```
3000:00 10 00 00 10 00 00 10 F4
3008:00 00 6C 00 01 EF 00 07 C4
3010:EF C0 0F EF E0 1F EF F0 CD
3018:3F C7 F8 E0 00 07 3F C7 99
3020:F8 1F EF F0 0F EF E0 07 D2
3028:EF C0 01 EF 00 00 6C 00 A8
3030:00 10 00 00 10 00 00 10 25
3038:00 00 00 00 00 00 00 FF 98
3040:00 40 00 00 40 00 00 40 F2
3048:00 00 7C 00 01 BF 00 07 46
3050:BF C0 0F 9F E0 1F CF F0 B0
3058:3F C6 0F 3C 00 78 E0 C7 1B
3060:F8 1F E7 F0 0F F3 E0 07 22
3068:FB C0 01 FB 00 00 7C 00 CF
3070:00 04 00 00 04 00 00 04 F5
3078:00 00 00 00 00 00 00 FF D8
3080:00 00 00 18 00 00 0C 00 7A
3088:00 06 7C 00 01 FF 03 06 0E
3090:7F C6 0F 3F EC 1F 8F D0 0C
3098:3F C6 38 3F 01 F8 38 C7 69
30A0:F8 17 E3 F0 6F F9 E0 C7 BB
30A8:FC C0 81 FF 00 00 7C C0 A1
30B0:00 00 60 00 00 30 00 00 DD
30B8:00 00 00 00 00 00 00 FF 19
30C0:00 00 00 00 00 00 60 00 E1
30C8:00 30 7C 06 19 FF 0C 07 0D
30D0:FF D8 09 FF 90 1C EF 30 8D
30D8:3E 46 78 3F 01 F8 3C C4 16
30E0:F8 19 EE 70 13 FF 20 37 F8
30E8:FF C0 61 FF 30 C0 7C 18 3B
30F0:00 00 0C 00 00 00 00 00 D2
30F8:00 00 00 00 00 00 00 FF 59
3100:00 00 00 00 00 00 00 00 62
3108:0C C0 7C 18 61 FF 30 37 54
3110:FF C0 0F FF 20 13 EE 70 20
3118:39 C4 F8 3C 00 78 3E 47 D0
3120:38 1C EF 90 09 FF E0 07 BD
3128:FF D8 19 FF 0C 30 7C 06 04
3130:60 00 00 00 00 00 00 00 C2
3138:00 00 00 00 00 00 00 FF 9A
3140:00 00 00 00 00 30 00 00 63
3148:60 00 7C C0 81 FF 00 C7 4A
3150:FC C0 6F F9 E0 17 E3 F0 0B
3158:38 C7 F8 3E 00 F8 3F C6 F4
3160:38 1F 8F D0 0F 3F EC 06 FA
3168:7F C6 01 FF 03 06 7C 00 85
3170:0C 00 00 18 00 00 00 00 5A
3178:00 00 00 00 00 00 00 FF DA
3180:00 04 00 00 04 00 00 04 08
3188:00 00 7C 00 01 FB 00 07 79
3190:FB C0 0F F7 E0 1F EF F0 D6
3198:E1 C7 F8 3C 00 78 3F C7 E8
31A0:0F 1F EF F0 0F DF E0 07 20
31A8:BF C0 01 BF 00 00 7C 00 30
31B0:00 40 00 00 40 00 00 40 65
31B8:00 00 00 00 00 00 00 FF 1B
31C0:00 00 00 00 00 00 00 38 5B
31C8:00 00 38 00 00 38 00 18 2B
31D0:38 30 18 38 30 18 38 30 64
31D8:18 38 30 1F FF F0 1F FF 4F
31E0:F0 1F FF F0 0F FF E0 07 D3
31E8:FF C0 03 FF 80 01 FF 00 E3
31F0:00 38 00 00 38 00 00 10 33
31F8:00 00 00 00 00 00 00 1F 7A
3200:00 00 00 00 00 00 00 20 84
3208:00 00 60 30 00 C0 70 01 60
3210:80 E0 03 01 C0 07 83 80 07
3218:0F C7 00 0F EE 00 0F FC 79
3220:04 0F FC 0C 0F FE 18 0F 5E
3228:FF 30 07 FF E0 03 FF C0 4D
3230:07 FF 80 0E 7F 00 0C 00 1D
3238:00 00 00 00 00 00 00 00 9C
3240:00 00 00 00 00 00 00 00 A4
3248:00 01 FF C0 03 F8 00 07 FB
3250:F8 00 0F F8 00 1F F8 00 11
3258:1F F8 00 7F FF FE 7F FF 7D
3260:FE 1F F8 00 1F F8 00 0F 17
3268:F8 00 07 F8 00 03 F8 00 B7
3270:01 FF C0 00 00 00 00 00 6D
3278:00 00 00 00 00 00 00 20 FC
3280:00 00 00 00 00 00 0C 00 FC
3288:00 0E 7F 00 07 FF 80 03 9C
3290:FF C0 07 FF E0 0F FF 30 79
3298:0F FE 18 0F FC 0C 0F FC 6B
32A0:04 0F EE 00 0F C7 00 07 47
32A8:83 80 03 01 C0 01 80 E0 4B
32B0:00 C0 70 00 60 30 00 20 37
32B8:00 00 00 00 00 00 00 20 3D
32C0:00 00 00 00 00 00 00 10 35
32C8:00 00 38 00 00 38 00 01 16
32D0:FF 00 03 FF 80 07 FF C0 76
32D8:0F FF E0 1F FF F0 1F FF D4
32E0:F0 1F FF F0 18 38 30 18 AE
32E8:38 30 18 38 30 18 38 30 7E
32F0:00 38 00 00 38 00 00 38 5D
32F8:00 00 00 00 00 00 00 1F 7C
3300:00 00 00 00 00 00 00 00 66
3308:30 00 FE 70 01 FF E0 03 3A
3310:FF C0 07 FF E0 0C FF F0 AF
3318:18 7F F0 30 3F F0 20 3F C8
3320:F0 00 77 F0 00 E3 F0 01 6F
3328:C1 E0 03 80 C0 07 01 80 B4
3330:0E 03 00 0C 06 00 00 04 53
3338:00 00 00 00 00 00 00 20 BE
3340:00 00 00 00 00 00 00 00 A6
3348:00 03 FF 80 00 1F C0 00 75
3350:1F E0 00 1F F0 00 1F F8 2F
3358:00 1F F8 7F FF FE 7F FF 98
3360:FE 00 1F F8 00 1F F8 00 28
3368:1F F0 00 1F E0 00 1F C0 92
3370:03 FF 80 00 00 00 00 00 68
3378:00 00 00 00 00 00 00 20 FE
3380:00 00 00 00 00 00 00 04 EA
3388:00 0C 06 00 0E 03 00 07 36
3390:01 80 03 80 C0 01 C1 E0 6E
3398:00 E3 F0 00 77 F0 20 3F 15
33A0:F0 30 3F F0 18 7F F0 0C 2F
33A8:FF F0 07 FF E0 03 FF C0 FF
33B0:01 FF E0 00 F0 70 00 00 6D
33B8:30 00 00 00 00 00 00 00 37
33C0:00 00 00 00 00 00 00 00 27
33C8:00 00 00 00 00 00 00 00 2F
33D0:00 00 00 00 00 00 00 00 37
33D8:00 44 00 00 38 00 00 7C 8E
33E0:00 00 38 00 00 44 00 00 5F
33E8:00 00 00 00 00 00 00 00 4F
33F0:00 00 00 00 00 00 00 00 57
33F8:00 00 00 00 00 00 00 01 60
3400:00 00 00 00 00 00 00 00 68
3408:00 00 00 00 00 00 00 00 70
3410:00 00 00 00 00 00 00 00 78
3418:00 2A 00 00 1C 00 00 3E 2A
3420:00 00 1C 00 00 2A 00 00 B4
3428:00 00 00 00 00 00 00 00 90
3430:00 00 00 00 00 00 00 00 98
3438:00 00 00 00 00 00 00 00 A0
3440:00 00 00 00 00 00 00 00 A8
3448:00 00 00 00 00 00 00 00 B0
3450:00 00 00 88 80 00 49 00 D7
3458:00 2A 00 00 1C 00 00 FF 2C
3460:80 00 1C 00 00 2A 00 00 35
3468:49 00 00 88 80 00 00 00 02
3470:00 00 00 00 00 00 00 00 D8
3478:00 00 00 00 00 00 00 00 E0
3480:00 00 00 00 00 00 00 00 E8
3488:00 00 00 00 02 08 20 01 62
3490:08 40 00 88 80 00 49 00 2C
3498:00 2A 00 00 1C 00 03 FF 72
34A0:E0 00 1C 00 00 2A 00 00 A5
34A8:49 00 00 88 80 01 08 40 96
34B0:02 08 20 00 00 00 00 00 20
34B8:00 00 00 00 00 00 00 00 21
34C0:00 00 00 00 00 00 08 08 41
34C8:08 04 08 10 02 08 20 01 A9
34D0:08 40 00 88 80 00 49 00 6C
34D8:00 2A 00 00 1C 00 0F FF CA
34E0:F8 00 1C 00 00 2A 00 00 F1
34E8:49 00 00 88 80 01 08 40 D6
34F0:02 08 20 04 08 10 08 08 39
34F8:08 00 00 00 00 00 00 00 65
3500:20 08 02 10 08 04 08 08 26
3508:08 04 08 10 02 08 20 01 EA
3510:08 40 00 88 80 00 49 00 AD
3518:00 2A 00 00 1C 00 3F FF 6C
3520:FE 00 1C 00 00 2A 00 00 36
3528:49 00 00 88 80 01 08 40 18
3530:02 08 20 04 08 10 08 08 7A
3538:08 10 08 04 20 08 02 00 11
3540:20 08 02 10 08 04 08 08 66
3548:08 04 08 10 02 08 20 01 2B
3550:08 40 00 88 80 00 6B 00 32
3558:00 7F 00 00 22 00 3F E3 16
3560:FE 00 22 00 00 7F 00 00 8C
3568:6B 00 00 88 80 01 08 40 69
3570:02 08 20 04 08 10 08 08 BA
3578:08 10 08 04 20 08 02 00 51
3580:20 08 02 10 08 04 08 08 A6
3588:08 04 08 10 02 08 20 01 6B
3590:C9 C0 01 FF C0 01 80 C0 FB
3598:00 80 80 00 80 80 3F 80 38
35A0:FE 00 80 80 00 80 80 01 A6
35A8:80 C0 01 FF C0 01 C9 C0 02
35B0:02 08 20 04 08 10 08 08 FA
35B8:08 10 08 04 20 08 02 00 91
35C0:02 08 00 01 04 38 01 04 45
35C8:40 01 08 40 01 11 80 00 E5
35D0:92 00 00 44 00 00 44 00 51
35D8:38 87 80 44 04 7C 42 64 90
35E0:02 01 A6 01 00 21 00 00 F5
35E8:48 80 00 84 40 01 04 26 14
35F0:19 04 25 26 04 18 40 02 F2
35F8:00 00 01 00 00 01 00 00 87
3600:00 00 00 00 00 00 00 00 6C
```

Program 3: Quolerus—ML Program

See instructions in article on page 55 before typing in.

```
C000:A9 C2 8D 0B CF 8D 0D CF 08
C008:A9 03 8D 02 CF A9 04 8D AB
C010:0F CF A9 0F 8D 21 CF 8D 51
C018:18 D4 A9 08 8D 28 CF A9 E6
C020:05 8D 15 D0 78 A9 C0 8D B0
C028:14 03 8D 15 03 58 A9 00 44
C030:8D 10 CF 8D 05 CF 8D 04 D5
C038:CF 8D 33 CF 8D 2B CF 8D AE
C040:43 CF 20 A6 C0 20 50 C3 B0
C048:20 40 C2 20 D8 C3 20 10 6A
C050:C8 AD 01 D0 D0 01 60 AD C7
C058:33 CF 29 04 F0 03 4C 66 5F
C060:C8 20 8E C9 20 20 C6 20 EB
C068:20 CA 4C 45 C0 00 00 00 90
C070:00 00 00 00 00 00 00 00 F1
C078:00 00 00 00 00 00 00 00 F9
C080:00 00 00 00 00 00 00 00 02
C088:A2 00 BD FA 07 C9 D0 B0 74
C090:07 C9 C6 B0 09 FE FA 07 2D
```

```
C098:E8 E0 05 90 ED 60 A9 C0 75
C0A0:9D FA 07 4C 98 C0 A9 C0 31
C0A8:8D FA 07 8D FB 07 8D FC 7D
C0B0:07 8D FD 07 8D FE 07 60 20
C0B8:00 00 00 00 00 00 00 00 3A
C0C0:AD 02 CF F0 06 CE 02 CF E1
C0C8:4C 31 EA A9 03 8D 02 CF D6
C0D0:A2 00 8E 03 CF 8E 04 CF 36
C0D8:8E 07 CF AD 00 DC 4A B0 F0
C0E0:03 EE 07 CF 4A 4A B0 03 5D
C0E8:CE 03 CF 4A B0 03 EE 03 A3
C0F0:CF 4A B0 03 EE 04 CF 20 7A
C0F8:10 C1 4C 31 EA 00 00 00 E6
C100:00 00 00 00 00 00 00 00 83
C108:00 00 00 00 00 00 00 00 8B
C110:AD 03 CF F0 0D C9 01 D0 96
C118:06 20 40 C1 4C 22 C1 20 59
C120:60 C1 20 00 C4 20 B0 C4 15
C128:4C 88 C0 00 00 00 00 00 0C
C130:00 00 00 00 00 00 00 00 B3
C138:00 00 00 00 00 00 00 00 BB
C140:AD F8 07 C9 CE 90 06 A9 C4
C148:C7 8D F8 07 60 EE F8 07 5A
C150:60 00 00 00 00 00 00 00 04
C158:00 00 00 00 00 00 00 00 DB
C160:AD F8 07 C9 C7 F0 02 B0 2D
C168:06 A9 CE 8D F8 07 60 CE 7F
C170:F8 07 60 00 00 00 00 00 3E
C178:00 00 00 00 00 00 00 00 FB
C180:A9 00 8D 06 CF 4C 8D C1 77
C188:A9 01 8D 06 CF A2 CE A9 83
C190:01 EC F8 07 F0 09 0A CA E9
C198:E0 C7 90 03 4C 91 C1 8D 7A
C1A0:08 CF 4C B0 C1 00 00 00 BE
C1A8:00 00 00 00 00 00 00 00 2C
C1B0:A9 00 8D 09 CF 4E 08 CF E2
C1B8:AD 08 CF F0 0C AD 09 CF 17
C1C0:18 69 03 8D 09 CF 4C B5 B9
C1C8:C1 AC 09 CF AD 06 CF D0 6C
C1D0:04 8C 0C CF 60 8C 0A CF 11
C1D8:60 00 00 00 00 00 00 00 8C
C1E0:A9 80 8D 0B D4 A9 09 8D A8
C1E8:0C D4 A9 08 8D 08 D4 A9 3D
C1F0:81 8D 0B D4 60 00 00 00 4A
C1F8:00 00 00 00 00 00 00 00 7C
C200:4C B0 C2 4C B6 C2 4C B9 08
C208:C2 4C BC C2 4C BF C2 4C F8
C210:C5 C2 4C C8 C2 4C CB C2 E0
C218:00 00 00 00 00 00 00 00 9D
C220:A9 80 8D 12 D4 A9 05 8D 52
C228:0F D4 A9 0C 8D 13 D4 8D 50
C230:14 D4 A9 81 8D 12 D4 60 01
C238:00 00 00 00 00 00 00 00 BD
C240:AD 07 CF D0 0B A9 80 8D F2
C248:04 D4 AD 10 CF D0 1D 60 18
C250:20 80 C1 AD F8 07 CD 10 A8
C258:CF F0 0B 8D 10 CF A9 00 4F
C260:8D 11 CF 8D 0E CF 20 95 49
C268:C2 4C 88 C2 AD 0E CF F0 D5
C270:04 CE 0E CF 60 AD 11 CF 16
C278:C9 20 90 06 A9 00 8D 10 D5
C280:CF 60 EE 11 CF 8D 0E CF 95
C288:A2 00 A9 01 8D 12 CF 6C 65
C290:0C CF 00 00 00 A9 08 8D 54
C298:00 D4 8D 01 D4 A9 80 8D F0
C2A0:06 D4 A9 81 8D 04 D4 60 32
C2A8:00 00 00 00 00 00 00 00 2E
C2B0:20 D0 C2 4C 30 C3 4C D0 91
C2B8:C2 20 D0 C2 4C 40 C3 20 F8
C2C0:00 C3 4C 40 C3 4C 00 C3 D7
C2C8:20 00 C3 4C 30 C3 00 00 2C
C2D0:AD 10 D0 2D 12 CF D0 07 96
C2D8:BD 00 D0 C9 1A 90 16 DE 12
C2E0:00 D0 BD 00 D0 C9 FF D0 D0
C2E8:0B AD 12 CF 49 FF 2D 10 53
C2F0:D0 8D 10 D0 60 E0 02 90 6C
C2F8:03 8E 13 CF 60 00 00 00 06
C300:AD 10 D0 2D 12 CF F0 07 08
C308:BD 00 D0 C9 40 B0 12 FE 0D
C310:00 D0 BD 00 D0 D0 09 AD 0D
C318:12 CF 0D 10 D0 8D 10 D0 EC
C320:60 4C F5 C2 00 00 00 00 D5
C328:00 00 00 00 00 00 00 00 AF
C330:BD 01 D0 C9 34 90 04 DE 58
C338:01 D0 60 4C F5 C2 00 00 FF
C340:BD 01 D0 C9 E4 B0 04 FE 8E
C348:01 D0 60 4C F5 C2 00 00 10
C350:AE 0F CF CA D0 01 60 A0 85
C358:FF 88 D0 FD 4C 53 C3 00 33
C360:00 00 00 00 00 00 00 00 E7
C368:00 00 00 00 00 00 00 00 EF
C370:AD 00 D0 8D 02 D0 AD 01 71
C378:D0 8D 03 D0 AD 10 D0 29 B1
C380:01 F0 08 A9 02 0D 10 D0 95
C388:8D 10 D0 A9 CF 8D F9 07 3F
C390:A9 02 8D 28 D0 8D 05 CF 38
C398:20 88 C1 20 E0 C1 A9 00 ED
C3A0:8D 13 CF A9 02 8D 12 CF 82
C3A8:AA 20 AF C3 4C B2 C3 6C E0
C3B0:0A CF AD 13 CF F0 1B A9 3A
C3B8:00 8D 02 D0 8D 03 D0 8D 98
C3C0:05 CF A2 FD 8A 2D 15 D0 F6
C3C8:8D 15 D0 8A 2D 10 D0 8D F7
C3D0:10 D0 60 00 00 00 00 00 A0
C3D8:AD 05 CF F0 03 4C 9E C3 CB
C3E0:AD 04 CF F0 18 20 70 C3 2F
C3E8:A0 0E 20 9E C3 AD 05 CF E0
C3F0:F0 0B 88 D0 F5 AD 15 D0 33
C3F8:09 02 8D 15 D0 60 00 00 90
C400:A9 0F 85 FB 85 FD A9 04 0E
C408:85 FC A9 D8 85 FE A0 00 BF
C410:B1 FB 99 14 CF B1 FD 29 50
C418:0F 19 14 CF 99 14 CF CC 78
C420:1E CF F0 05 C8 C8 4C 10 2D
C428:C4 A0 28 B1 FB AA 98 38 50
C430:E9 28 A8 8A 91 FB CC 1E AA
C438:CF F0 08 98 18 69 2A A8 D3
C440:4C 2B C4 A0 28 B1 FD 29 8A
C448:0F AA 98 38 E9 28 A8 8A 66
C450:91 FD CC 1E CF F0 08 98 88
C458:18 69 2A A8 4C 45 C4 A5 BE
C460:FB 18 69 28 85 FB 85 FD C2
C468:90 04 E6 FC E6 FE A5 FC 63
C470:C9 07 90 06 A5 FB C9 CF 93
C478:B0 03 4C 29 C4 A0 00 B9 99
C480:14 CF AA 29 F0 91 FB 8A 40
C488:29 0F 91 FD CC 1E CF F0 EB
C490:05 C8 C8 4C 7F C4 60 00 7C
C498:00 00 00 00 00 00 00 00 22
C4A0:00 00 00 00 00 00 00 00 2A
C4A8:00 00 00 00 00 00 00 00 32
C4B0:A9 D0 85 FB 85 FD A9 07 32
C4B8:85 FC A9 DB 85 FE A0 00 A0
C4C0:B1 FB 99 15 CF B1 FD 29 11
C4C8:0F 19 15 CF 99 15 CF CC 4D
C4D0:1E CF F0 05 C8 C8 4C C0 8E
C4D8:C4 A9 04 C5 FC 90 06 A9 EB
C4E0:10 C5 FB B0 03 4C 02 C5 81
C4E8:A0 00 B9 15 CF AA 29 F0 B7
C4F0:91 FB 8A 29 0F 91 FD CC AD
C4F8:1E CF F0 05 C8 C8 4C EA E0
C500:C4 60 A5 FB 38 E9 28 85 B9
C508:FB 85 FD B0 04 C6 FC C6 B9
C510:FE A0 00 B1 FB AA 98 18 32
C518:69 28 A8 8A 91 FB 98 38 06
C520:E9 26 A8 CC 1E CF F0 02 20
C528:B0 03 4C 13 C5 A0 00 B1 E9
C530:FD 29 0F AA 98 18 69 28 B1
C538:A8 8A 91 FD 98 38 E9 26 6C
C540:A8 CC 1E CF F0 02 B0 03 08
C548:4C 2F C5 4C D9 C4 00 00 25
C550:A9 04 8D 2D CF AD 40 CF BB
C558:4A 4A A0 02 4A B0 07 C8 BB
C560:0E 2D CF 4C 5C C5 98 0A 32
C568:8D 2C CF 60 00 00 00 00 C5
C570:AD 2D CF F0 23 A8 C9 80 F6
C578:D0 09 20 1E CB 20 F2 C7 21
C580:4C B7 C3 2D 33 CF D0 10 F5
C588:C0 04 D0 03 20 10 CB 20 B8
C590:17 CB 20 B7 C3 4C 70 C9 14
C598:60 00 00 00 00 00 00 00 54
C5A0:A2 00 A9 D7 85 02 A9 03 BA
C5A8:85 03 AD 02 D0 38 E9 19 E1
C5B0:4A 4A 4A 18 69 02 9D 1F 6C
C5B8:CF E0 00 D0 0A AD 03 D0 4F
C5C0:38 E9 33 E8 4C B0 C5 A2 2B
C5C8:00 AD 20 CF C9 06 90 0A 52
C5D0:E8 38 E9 06 8D 20 CF 4C 55
C5D8:CC C5 C9 00 F0 0F A5 02 69
C5E0:18 69 F0 85 02 90 02 E6 86
C5E8:03 CA 4C DA C5 AE 20 CF D8
C5F0:F0 0F A5 02 18 69 28 85 C9
C5F8:02 90 02 E6 03 CA 4C F0 25
C600:C5 A5 02 18 6D 1F CF 85 A8
C608:02 90 02 E6 03 60 00 00 03
C610:00 00 00 00 00 00 00 00 9D
C618:00 00 00 00 00 00 00 00 A5
C620:A9 00 8D 13 CF A2 04 AD 24
C628:21 CF F0 06 20 30 C3 4C 4E
C630:35 C6 20 40 C3 AD 13 CF DC
C638:F0 08 AD 21 CF 49 0F 8D 57
C640:21 CF AD 15 D0 2D 27 CF B2
C648:CD 27 CF F0 08 AD 21 CF 98
C650:CD 2A CF D0 03 4C A0 C6 A7
C658:8D 2A CF A9 08 AA 2D 15 26
C660:D0 F0 04 0A 4C 5D C6 8A A3
C668:A8 A2 00 4A F0 04 E8 4C 4D
C670:6B C6 AD 21 CF F0 02 A9 1D
C678:FF 9D 1F CF 8A 9D 27 D0 38
C680:0A AA AD 04 D0 9D 00 D0 81
C688:AD 05 D0 9D 01 D0 98 0D AB
C690:15 D0 8D 15 D0 4C A0 C6 9F
C698:00 00 00 00 00 00 00 00 26
C6A0:AD 28 CF 2D 15 D0 D0 03 6C
C6A8:4C 09 C7 8D 12 CF A2 00 85
C6B0:8E 13 CF 4A F0 04 E8 4C 9E
C6B8:B3 C6 8A A8 0A AA B9 1F 3B
C6C0:CF 8D 29 CF 29 F0 D0 06 70
C6C8:20 00 C3 4C D1 C6 20 D0 5E
C6D0:C2 AD 13 CF F0 0D AD 29 CA
C6D8:CF 49 F0 8D 29 CF A9 00 73
C6E0:8D 13 CF AD 29 CF 29 0F B8
C6E8:D0 06 20 40 C3 4C F3 C6 66
C6F0:20 30 C3 AD 13 CF F0 08 AF
C6F8:AD 29 CF 49 0F 8D 29 CF 07
C700:AD 29 CF 99 1F CF 20 30 EC
C708:C7 0E 28 CF AD 28 CF C9 78
C710:80 F0 08 2D 33 CF D0 F1 5C
C718:4C 23 C7 A9 08 8D 28 CF C0
C720:4C 0C C7 60 00 00 00 00 D7
C728:00 00 00 00 00 00 00 00 B7
C730:AD 2B CF F0 03 4C C0 C7 FC
C738:AD 00 D0 DD 00 D0 F0 09 C4
C740:AD 01 D0 DD 01 D0 F0 12 1E
C748:60 A0 01 AD 01 D0 DD 01 33
C750:D0 90 01 C8 8C 2B CF 4C 16
C758:68 C7 A0 03 AD 00 D0 DD 3F
C760:00 D0 90 01 C8 8C 2B CF E4
C768:BD 00 D0 8D 0E D0 BD 01 F9
C770:D0 8D 0F D0 8A 4A AA A9 37
C778:01 0A CA F0 03 4C 79 C7 77
C780:09 01 8D 12 CF 2D 10 D0 CB
C788:F0 24 CD 12 CF F0 17 AE 93
C790:2B CF E0 03 B0 03 4C F2 13
C798:C7 C9 01 D0 06 EE 2B CF BD
C7A0:4C AE C7 CE 2B CF A9 80 54
C7A8:0D 10 D0 8D 10 D0 A9 CF 9C
C7B0:8D FF 07 A9 06 8D 2E D0 16
C7B8:A9 80 0D 15 D0 8D 15 D0 E7
C7C0:A9 80 8D 12 CF A9 00 8D CA
C7C8:13 CF A2 0E 20 D2 C7 4C 33
C7D0:ED C7 AD 2B CF C9 01 D0 2A
C7D8:03 4C 30 C3 C9 02 D0 03 3A
C7E0:4C 40 C3 C9 03 D0 03 4C 69
C7E8:D0 C2 4C 00 C3 AD 13 CF E5
C7F0:F0 1B A9 00 8D 0E D0 8D C8
C7F8:0F D0 8D 2B CF A2 7F 8A 3B
C800:2D 15 D0 8D 15 D0 8A 2D 8E
C808:10 D0 8D 10 D0 60 00 00 90
C810:20 16 C8 4C 31 C8 AD 1F 3C
C818:D0 4A 90 03 4C 70 CB 4A EC
C820:90 03 4C 60 C9 4A 4A 4A A0
C828:4A 4A 4A 90 03 4C F2 C7 BA
C830:60 AD 1E D0 8D 40 CF 29 64
C838:03 D0 01 60 AD 40 CF 4A FD
C840:90 03 4C 90 CA 4A A0 00 2E
C848:4A 90 01 C8 C9 00 D0 F8 B8
C850:C0 02 B0 06 20 50 C5 4C 53
C858:70 C5 A2 02 8E 41 CF 20 41
C860:80 C8 4C 70 C5 00 A9 10 86
C868:8D 0F CF 20 50 C3 20 8E E0
C870:C9 AD 33 CF D0 F5 A2 80 D9
C878:20 53 C3 4C BF CA 00 00 55
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```
C890:CF 20 50 C5 AD 40 CF 4D D3
C898:2D CF 8D 40 CF AC 2C CF C3
C8A0:B9 00 D0 8D 31 CF BD 00 46
C8A8:D0 8D 32 CF AD 2D CF 0D 18
C8B0:41 CF 8D 2D CF 2D 10 D0 7F
C8B8:F0 1F CD 2D CF F0 1A CD 5B
C8C0:41 CF F0 0C A9 FF 38 ED 71
C8C8:32 CF 8D 32 CF 4C D9 C8 68
C8D0:A9 FF 38 ED 31 CF 8D 31 32
C8D8:CF AD 31 CF CD 32 CF 90 48
C8E0:0A 38 ED 32 CF 8D 31 CF 4D
C8E8:4C F5 C8 AD 32 CF 38 ED 41
C8F0:31 CF 8D 31 CF B9 01 D0 0C
C8F8:DD 01 D0 90 0A 38 FD 01 0B
C900:D0 8D 32 CF 4C 11 C9 BD 9A
C908:01 D0 38 F9 01 D0 8D 32 8F
C910:CF AD 31 CF CD 30 CF F0 D9
C918:02 B0 21 AD 32 CF CD 44 88
C920:CF F0 02 B0 17 8D 44 CF 6A
C928:AD 31 CF 8D 30 CF AD 2C F9
C930:CF 8D 2E CF AD 2D CF 29 BC
C938:FC 8D 2F CF AD 40 CF 29 C7
C940:FC D0 0D AD 2E CF 8D 2C FA
C948:CF AD 2F CF 8D 2D CF 60 33
C950:8D 40 CF 4C 91 C8 00 00 29
C958:00 00 00 00 00 00 00 00 EB
C960:20 A0 C5 A0 00 A9 20 91 67
C968:02 20 B7 C3 4C 1E CB 00 AA
C970:AD 2D CF 0D 33 CF 8D 33 18
C978:CF 20 0C C7 AD 2C CF 4A 02
C980:AA A9 D0 9D F8 07 A9 08 07
C988:8D 36 CF 4C 20 C2 AD 33 C9
C990:CF D0 01 60 AD 36 CF F0 3D
C998:04 CE 36 CF 60 A9 08 8D EC
C9A0:36 CF AD 33 CF A2 00 4A 7F
C9A8:B0 04 E8 4C A7 C9 BC F8 4E
C9B0:07 C0 D7 B0 0A FE F8 07 43
C9B8:C9 00 D0 EE 4C E0 CA 8D 43
C9C0:34 CF 8E 35 CF A9 C0 9D CB
C9C8:F8 07 8A 0A AA A9 00 9D 26
C9D0:00 D0 9D 01 D0 8A 4A AA 4C
C9D8:A9 01 E0 00 F0 05 CA 0A D8
C9E0:4C DA C9 AA 2D 42 CF F0 38
C9E8:03 EE 43 CF 8A 49 FF AA 43
C9F0:2D 15 D0 8D 15 D0 8A 2D 81
C9F8:10 D0 8D 10 D0 8A 2D 33 B9
CA00:CF 8D 33 CF AD 34 CF AE D0
CA08:35 CF 4C B8 C9 00 00 00 8F
CA10:00 00 00 00 00 00 00 00 A5
CA18:00 00 00 00 00 00 00 00 AD
CA20:A2 00 AD 3D CF F0 03 20 F8
CA28:49 CA E8 AD 3E CF F0 03 23
CA30:20 49 CA E8 AD 3F CF F0 0B
CA38:03 20 49 CA A2 03 A9 00 A1
CA40:9D 3C CF CA D0 FA 4C 60 C5
CA48:CA BD 39 CF 18 7D 3D CF D7
CA50:9D 39 CF 60 00 00 00 00 03
CA58:00 00 00 00 00 00 00 00 ED
CA60:A0 05 A2 04 B9 36 CF C9 2C
CA68:3A 90 0C 38 E9 0A 99 36 25
CA70:CF FE 36 CF 4C 67 CA CA D1
CA78:88 D0 E9 A2 06 BD 36 CF 51
CA80:9D 01 04 A9 01 9D 01 D8 99
CA88:CA D0 F2 60 00 00 00 00 1C
CA90:A0 00 AD 40 CF 4A 4A 4A B6
CA98:90 01 C8 C9 00 D0 F8 C0 62
CAA0:02 B0 06 20 50 C5 4C B3 0C
CAA8:CA A2 00 A9 01 8D 41 CF 77
CAB0:20 80 C8 AD 2D CF 2D 33 A0
CAB8:CF F0 01 60 4C 70 CB A9 FD
CAC0:00 8D 18 D4 8D 15 D0 8D F9
CAC8:10 D0 A2 10 9D FF CF CA 47
CAD0:D0 FA 78 A9 31 8D 14 03 22
CAD8:A9 EA 8D 15 03 58 60 00 3B
CAE0:AD 42 CF D0 01 60 AD 43 0D
CAE8:CF C9 05 90 1B AD 27 CF 30
CAF0:4D 42 CF 8D 27 CF 4E 42 E7
CAF8:CF A2 00 AD 42 CF C9 10 EE
CB00:D0 03 8E 42 CF 8E 43 CF C5
CB08:60 00 00 00 00 00 00 00 CF
CB10:A2 00 A9 02 4C 22 CB A2 73
CB18:01 A9 01 4C 22 CB A2 02 07
CB20:A9 05 18 7D 3D CF 9D 3D 4A
CB28:CF 60 00 00 00 00 00 00 BF
CB30:A9 C0 85 FD A9 DB 85 FE 24
CB38:EE 45 CF EE 45 CF AD 45 8B
CB40:CF A0 27 91 FD 88 C0 FF 79
CB48:D0 F9 A9 D8 C5 FE 90 05 D9
CB50:A5 FD D0 01 60 A5 FD 38 32
CB58:E9 28 85 FD B0 02 C6 FE 99
CB60:4C 3B CB 00 00 00 00 00 66
CB68:00 00 00 00 00 00 00 00 FF
CB70:A2 01 8E 2D CF 8E 2C CF 1F
CB78:20 70 C9 4C 6B C8 00 00 B8
```

The GEOS Column:
Font Grabber

Article on page 77.

Program 1: Font Grabber

```
ES 10 POKE53280,0:POKE53281,0:
      POKE646,3
AS 20 POKE53272,PEEK(53272)OR2
HG 30 GOSUB1110
FE 40 PRINT"{2 DOWN}{3 SPACES}
      OPTIONS:
EF 50 PRINT"{DOWN}{13 SPACES}
      {RVS}1{OFF} DISK FILE.
EP 60 PRINT"{DOWN}{13 SPACES}
      {RVS}2{OFF} MEMORY.
EM 70 GETD$:IFD$=""THEN70
DD 80 D=VAL(D$):IFD<1 OR D>2 T
      HEN70
KQ 90 PRINT"{DOWN}{3 SPACES}GR
      AB:
XJ 100 PRINT"{DOWN}{10 SPACES}
       {RVS}1{OFF} SET#0 UPPER
       CASE/GRAPHICS."
MQ 110 PRINT"{DOWN}{10 SPACES}
       {RVS}2{OFF} SET#1 LOWER
       /UPPERCASE."
KF 120 GETG$:IFG$=""THEN120
AB 130 G=VAL(G$):IFG<1ORG>2 TH
       EN120
RP 140 GOSUB1110
SF 150 INPUT"{3 DOWN} NAME FOR
        NEW GEOS FONT";M$
ES 160 IFG=2THENF=2048
RD 170 IF D=2 THEN490
MG 180 PRINT"{CLR}{9 DOWN}
       {2 SPACES}INSERT DISK W
       ITH FONT FILE IN DRIVE:
       "
FR 190 GETA$:IFA$=""THEN190
EX 200 PRINT"{CLR}{6 DOWN}
       {2 SPACES}WHEN LISTING
       {SPACE}REACHES FONT TO
       {SPACE}EDIT,"
MR 210 PRINT"{DOWN}{15 SPACES}
       HIT A KEY.{2 DOWN}"
BK 220 OPEN15,8,15
QE 230 OPEN1,8,0,"$"
SS 240 GET#1,A$,A$
BB 250 GET#1,A$,A$
GD 260 IFA$=""THEN380
KA 270 GET#1,A$,A$
JR 280 GET#1,A$
PD 290 IFA$=CHR$(34)THENT=T+1
KS 300 IFA$=CHR$(34)ORT<>1THEN
       320
QC 310 D$=D$+A$
DC 320 IF A$=""THEN340
RM 330 GOTO280
CK 340 PRINTD$
DM 350 GETA$:IFA$<>""THEN380
KS 360 D$="":T=0
GP 370 GOTO250
AD 380 CLOSE1:CLOSE15
CR 390 PRINT"{DOWN}MOVE CURSOR
        TO SELECTION, HIT
       {RVS}RETURN{OFF}"
HE 400 INPUTN$
GS 410 OPEN3,8,8,N$+",P,R"
AE 420 E=12288
KB 430 POKE780,1:POKE781,8:POK
       E782,0
CF 440 SYS65466
AH 450 POKE780,0:POKE781,0:POK
       E782,E/256
KE 460 SYS65493
EA 470 IFPEEK(783)AND1THENPRIN
       T"LOAD ERROR":STOP
QJ 480 CLOSE3:GOTO510
CH 490 B=16384*(3-PEEK(56576)A
       ND3)
EB 500 E=B+(PEEK(53272)AND12)*
       1024+F
FJ 510 DIM A$(9,97)
XP 520 PRINT"{CLR}{7 DOWN} INS
       ERT GEOS DISK WITH <SWA
       P> IN DRIVE:"
GD 530 PRINT"{2 DOWN}
       {14 SPACES}{RVS} HIT RE
       TURN {OFF}"
CK 540 GET A$:IF A$=""THEN540
SM 550 PRINT"{DOWN}{13 SPACES}
       PLEASE WAIT....
SD 560 OPEN1,8,15,"I:0":OPEN2,
       8,2,"#0"
FQ 570 T=18:S=1
PG 580 PRINT#1,"U1";2;0;T;S
XA 590 GET#2,T$,S$
SS 600 T=ASC(T$+CHR$(0)):S=ASC
       (S$+CHR$(0))
HS 610 FOR I=0 TO 7
DG 620 PRINT#1,"B-P";2;32*I+2
DH 630 GET#2,Z$,P$,Q$
HG 640 IF Z$="" THEN670
FC 650 GET#2,X$
PE 660 IF ASC(X$)= 60 THEN710
MA 670 NEXT I
JH 680 IF T<>0 THEN580
KX 690 CLOSE1:CLOSE2
XC 700 PRINT"{CLR}{5 DOWN}
       {4 SPACES}<SWAP> NOT ON
        DISK.":GOTO520
XX 710 T=ASC(P$+CHR$(0)):S= AS
       C(Q$+CHR$(0))
KS 720 PRINT#1,"U1";2;0;T;S
JF 730 PRINT#1,"B-P";2;22
RP 740 GET#2,T$,S$
XE 750 T=ASC(T$+CHR$(0)):S=ASC
       (S$+CHR$(0))
FX 760 FOR J=0 TO 97:A$(0,J)=C
       HR$(0):NEXTJ
EM 770 FOR I=1 TO 8
GC 780 FOR J=0 TO 63
MF 790 A$(I,J)=CHR$(PEEK(E+8*(
       J+32)+I-1)):NEXTJ
PK 800 A$(I,64)=CHR$(PEEK(E+51
       2+I-1))
DJ 810 FOR J=65 TO 90
XP 820 A$(I,J)=CHR$(PEEK(E+8*(
       J-64)+I-1)):NEXTJ
FB 830 FOR J=91 TO 97
SC 840 A$(I,J)=CHR$(0):NEXTJ
EP 850 NEXTI
PX 860 FOR J=0 TO 97
PE 870 A$(I,J)=CHR$(0)
JS 880 NEXTJ
DP 890 P=204:J=0:I=0
JB 900 PRINT#1,"U1";2;0;T;S
AF 910 GET#2,T$,S$
PF 920 PRINT#1,"B-P";2;P
HF 930 PRINT#2,A$(I,J);
GS 940 J=J+1:IFJ=98THEN J=1:I=
       I+1
DH 950 IF I=10THEN1010
KF 960 P=P+1:IF P<256 THEN930
GK 970 P=2
SJ 980 PRINT#1,"U2";2;0;T;S
AE 990 T=ASC(T$+CHR$(0)):S=ASC
       (S$+CHR$(0))
JM 1000 GOTO900
CM 1010 PRINT#1,"R0:"+M$+"=<SW
```

```
        AP>"
SC 1020 PRINT"{CLR}{7 DOWN}
        {10 SPACES}CONVERSION
        {2 SPACES}COMPLETE"
SA 1030 PRINT"{DOWN}
        {10 SPACES}{RVS} REBOO
        T GEOS? (Y/N) {OFF}"
CR 1040 GETA$:IFA$=""THEN1040
PQ 1050 IF A$="N" THEN SYS6473
        8
KP 1060 CLOSE1:CLOSE2
DM 1070 PRINT"{CLR}{10 DOWN}
        {4 SPACES}PLACE GEOS B
        OOTDISK IN DRIVE.
JF 1080 PRINT"{DOWN}{9 SPACES}
        {RVS} HIT RETURN {OFF}
        "
GB 1090 GET A$:IF A$=""THEN109
        0
BM 1100 IFA=0 THEN A=1:LOAD"GE
        OS",8,1
XG 1110 PRINT"{CLR}{3 DOWN}
        {9 SPACES}{RVS}
        {21 SPACES}{OFF}"
HR 1120 PRINT"{9 SPACES}{RVS}
        {SPACE}{OFF} COMMODORE
         TO GEOS {RVS} {OFF}"
JE 1130 PRINT"{9 SPACES}{RVS}
        {21 SPACES}{OFF}"
JF 1140 PRINT"{9 SPACES}{RVS}
        {4 SPACES}FONT GRABBER
        {5 SPACES}{OFF}"
GG 1150 PRINT"{9 SPACES}{RVS}
        {21 SPACES}{OFF}"
GM 1160 PRINT"{DOWN}{3 SPACES}
        COPYRIGHT 1988 COMPUTE
        I PUB., INC."
RR 1170 PRINT"{10 SPACES}ALL R
        IGHTS RESERVED"
FM 1180 RETURN
```

Program 2: Font ID Changer

```
HF 10 DIM A$(33)
RC 20 PRINTCHR$(14):POKE53280,
      0:POKE53281,0:POKE646,3
JA 30 PRINT"{CLR}{8 DOWN}
      {8 SPACES}{RVS}
      {25 SPACES}{OFF}"
GP 40 PRINT"{8 SPACES}{RVS}
      {OFF} GEOS FONT I.D. EDI
      TOR {RVS} {OFF}"
XX 50 PRINT"{8 SPACES}{RVS}
      {25 SPACES}{OFF}"
RG 60 PRINT"{DOWN}{5 SPACES}
      {SHIFT-SPACE}COPYRIGHT 1
      988 COMPUTE! PUB.,"
MX 70 PRINT"{11 SPACES}ALL RIG
      HTS RESERVED"
QQ 80 PRINT"{DOWN}{8 SPACES}
      {RVS} PUT FONT DISK IN D
      RIVE: {OFF}"
SJ 90 PRINT"{DOWN}{15 SPACES}H
      IT A KEY.{2 DOWN}"
QF 100 GETA$:IFA$=""THEN100
QE 110 PRINT"{CLR}{6 DOWN}
       {2 SPACES}WHEN LISTING
       {SPACE}REACHES FONT TO
       {SPACE}EDIT,"
DJ 120 PRINT"{DOWN}{15 SPACES}
       HIT A KEY.{2 DOWN}"
MD 130 OPEN15,8,15
ES 140 OPEN1,8,0,"$"
HP 150 GET#1,A$,A$
PP 160 GET#1,A$,A$
KK 170 IFA$=""THEN290
DR 180 GET#1,A$,A$
DH 190 GET#1,A$
AP 200 IFA$=CHR$(34)THENT=T+1
BE 210 IFA$=CHR$(34)ORT<>1THEN
       230
KD 220 N$=N$+A$
QJ 230 IF A$=""THEN250
FE 240 GOTO190
BK 250 PRINTN$
AJ 260 GETD$:IFD$<>""THEN290
GR 270 N$="":T=0
SG 280 GOTO160
JS 290 CLOSE1:CLOSE15
XD 300 PRINT"{DOWN}MOVE CURSOR
       TO SELECTION, HIT
       {RVS}RETURN{OFF}"
QX 310 INPUTF$:C$=F$
QS 320 Y$=""
XM 330 FORI=1TO16-LEN(F$):F$=F
       $+CHR$(160):NEXT
RH 340 FOR I= 1 TO 16
SX 350 B=ASC(MID$(F$,I,1))
CB 360 IF B<192 THEN380
MF 370 B=B-96
JF 380 Y$=Y$+CHR$(B)
PX 390 NEXT I
EH 400 F$=Y$
BP 410 CLOSE15:CLOSE1
GR 420 OPEN1,8,15,"I:0":OPEN2,
       8,2,"#0"
SC 430 T=18:S=1
BR 440 PRINT#1,"U1";2;0;T;S
JG 450 PRINT#1,"B-P";2;0:GET#2
       ,T$,S$
PG 460 T=ASC(T$+CHR$(0)):S=ASC
       (S$+CHR$(0))
KH 470 FOR I=0 TO 7
ED 480 B$=""
JS 490 PRINT#1,"B-P";2;32*I+2
FF 500 GET#2,Q$,R$,P$
PA 510 FORJ=1 TO 16
DM 520 GET#2,A$:B$=B$+A$
GH 530 NEXT J
CQ 540 IF B$=Y$ THEN GOTO580
GJ 550 NEXT I
HR 560 IFT=0THENPRINT"NO FILE"
       :CLOSE1:CLOSE2:END
GJ 570 GOTO440
AP 580 GET#2,T$,S$:T=ASC(T$+CH
       R$(0)):S=ASC(S$+CHR$(0)
       )
RH 590 J=33
SG 600 PRINT#1,"U1";2;0;T;S
DK 610 PRINT#1,"B-P";2;128
AF 620 GET#2,L$,H$
QM 630 L=ASC(L$+CHR$(0))
JH 640 H=ASC(H$+CHR$(0))
AM 650 G=L+256*H
BF 660 IF Y<>15 THENY=15:O=G
JQ 670 PRINT"{CLR}{10 DOWN}
       {2 SPACES}CURRENT ID# F
       OR {RVS} ";C$;" {OFF} I
       S ";G
GF 680 PRINT"{2 DOWN}
       {2 SPACES}EDIT ID# ? (
       {RVS}Y{OFF}/{RVS}N{OFF}
       )"
FP 690 GETA$:IFA$=""THEN690
QP 700 IF A$<>"Y" AND A$<>"N"
       {SPACE}THEN690
MB 710 IF A$="Y" THEN740
RP 720 IFO=G THEN1040:REM QUIT
BC 730 GOTO820
GA 740 INPUT"{DOWN}{2 SPACES}C
       HANGE TO";N
BX 750 IFN=0 OR N>1027 THEN PR
       INT"MUST BE BETWEEN 1 A
       ND 1027{UP}":GOTO740
HX 760 H=INT(N/256):H$=CHR$(H)
RX 770 L=256*(N/256-H):L$=CHR$
       (L)
RF 780 PRINT#1,"B-P";2;128
AK 790 PRINT#2,L$;H$;
BE 800 PRINT#1,"U2";2;0;T;S
FP 810 GOTO590
KF 820 PRINT#1,"U2";2;0;T;S
XF 830 PRINT#1,"U1";2;0;T;S
MS 840 K=130
BX 850 PRINT#1,"B-P";2;K
KC 860 FORI=0TO J STEP 2
HF 870 GET#2,L$,H$
HM 880 L=ASC(L$+CHR$(0))
DH 890 H=ASC(H$+CHR$(0))
CP 900 G=L+256*H
DB 910 IF G=0 THEN J=J-2:GOTO9
       80
CG 920 G=G-64*(O-N)
XC 930 H=INT(G/256)
AJ 940 L=(G/256-H)*256
CP 950 A$(I)=CHR$(L)
QF 960 A$(I+1)=CHR$(H)
JD 970 NEXT I
JX 980 PRINT#1,"U1";2;0;T;S
PG 990 PRINT#1,"B-P";2;K
PA 1000 FOR I= 0TOJ STEP2
GP 1010 PRINT#2,A$(I);A$(I+1);
AP 1020 NEXT I
AD 1030 PRINT#1,"U2";2;0;T;S
HF 1040 CLOSE1:CLOSE2
PE 1050 PRINT"{CLR}{8 DOWN}
        {14 SPACES}{RVS}
        {2 SPACES}COMPLETE
        {2 SPACES}"
BB 1060 PRINT"{2 DOWN}
        {11 SPACES}EDIT ANOTHE
        R ({RVS}Y{OFF}/{RVS}N
        {OFF} ?"
CG 1070 GETA$:IFA$<>"Y"AND A$<
        >"N"THEN1070
KG 1080 IF A$="Y" THEN80
AK 1090 CLOSE1:CLOSE2
GB 1100 PRINT"{CLR}{9 DOWN}
        {12 SPACES}{RVS} REBOO
        T GEOS ? {OFF}"
AG 1110 PRINT"{2 DOWN}
        {14 SPACES}{RVS}Y{OFF}
        ES OR {RVS}N{OFF}O ?"
SX 1120 GETA$:IFA$<>"Y"AND A$<
        >"N"THEN1120
BQ 1130 IFA$="N"THEN END
SC 1140 PRINT"{CLR}{10 DOWN}
        {5 SPACES}{RVS} INSERT
         GEOS BOOTDISK IN DRIV
        E {OFF}"
QC 1150 PRINT"{DOWN}
        {14 SPACES}HIT RETURN"
JC 1160 GETA$:IFA$=""THEN1160
FQ 1170 LOAD"GEOS",8,1
PM 1180 END
```

Magnifier

See instructions in article on page 84 before typing in.

```
0801:19 08 FF FF 9E C2 28 34 24
0809:33 29 AA 36 34 AA C2 28 AF
0811:34 34 29 AC 32 35 36 00 0B
0819:3F 08 FF FF 8F 14 14 14 D3
0821:14 14 14 14 14 14 28 43 88
0829:29 20 31 39 38 38 20 43 B5
0831:4F 4D 50 55 54 45 21 20 B5
0839:50 55 42 4C 2E 00 00 00 45
0841:A4 2C A5 2B 18 69 D0 85 A3
0849:FB 90 01 C8 84 FC A9 10 A3
0851:85 FE A9 00 85 FD A0 00 7E
0859:A2 00 B1 FB 91 FD C8 D0 97
0861:F9 E6 FE E6 FC E8 E0 05 C8
0869:90 F0 78 A9 00 8D 14 03 09
0871:A9 10 8D 15 03 58 A9 40 6A
0879:85 2C 85 2E A9 7F 8D 0D 5E
0881:DC A5 01 29 FB 85 01 A0 B4
0889:00 8C 00 40 A9 30 85 FC D6
0891:A9 00 85 FB A9 D0 85 FE 81
0899:A9 00 85 FD A2 00 B1 FD 85
08A1:91 FB C8 D0 F9 E6 FC E6 EB
08A9:FE E8 E0 10 90 F0 A5 01 25
08B1:09 04 85 01 A9 81 8D 0D 83
08B9:DC AD 18 D0 29 F0 09 0C DE
08C1:8D 18 D0 A0 00 A9 20 99 43
08C9:C0 0B C8 C0 28 90 F8 60 F7
```

```
08D1:8D 3C 13 8C 3E 13 8E 3D 7B
08D9:13 08 AD 6A 13 D0 0B 20 E3
08E1:9E 12 20 D4 12 A9 01 8D DD
08E9:6A 13 A5 C5 C9 21 D0 0A 83
08F1:AD 8D 02 C9 04 D0 6B 4C 9F
08F9:41 13 C9 0C D0 17 AD 8D 35
0901:02 C9 04 D0 06 20 9F 10 14
0909:4C 78 10 C9 05 D0 3C 20 02
0911:C6 11 4C 92 10 C9 07 D0 04
0919:17 AD 8D 02 C9 05 D0 06 FD
0921:20 E4 11 4C 78 10 C9 04 FE
0929:D0 21 20 FD 11 4C 78 10 8A
0931:C9 02 D0 17 AD 8D 02 C9 A5
0939:05 D0 06 20 16 12 4C 78 CE
0941:10 C9 04 D0 06 20 2F 12 7C
0949:20 D4 12 AD 4B 12 F0 12 54
0951:EE 40 13 AD 40 13 C9 05 0F
0959:90 08 A9 00 8D 40 13 20 9E
0961:AF 10 AD 3C 13 AE 3D 13 A9
0969:AC 3E 13 28 4C 31 EA AD F0
0971:18 D0 29 0F 09 20 8D 18 D5
0979:D0 A9 01 8D 4B 12 60 A9 64
0981:08 8D C3 11 A9 00 8D C4 B1
0989:11 8D C5 11 8D 4A 12 AD B8
0991:53 12 8D 52 12 AD 48 12 92
0999:8D C1 11 AD 55 12 8D 54 42
09A1:12 A9 00 85 FB A9 04 85 93
09A9:FC AE 52 12 E0 00 F0 0F 49
09B1:A9 28 18 65 FB 85 FB 90 7A
09B9:02 E6 FC CA 4C DC 10 AD 76
09C1:18 D0 29 02 D0 0B A9 30 8F
09C9:85 FE A9 00 85 FD 4C 09 59
09D1:11 A9 00 85 FD A9 38 85 BB
09D9:FE A0 00 8C C0 11 AC 54 54
09E1:12 B1 FB 0A 2E C0 11 0A 2A
09E9:2E C0 11 0A 2E C0 11 18 B4
09F1:65 FD 85 FD AD C0 11 18 71
09F9:65 FE 85 FE AD C3 11 85 43
0A01:FC AD C4 11 85 FB A0 00 06
0A09:A9 80 8D BF 11 A2 00 B1 84
0A11:FD A2 00 2D BF 11 F0 07 CA
0A19:A9 A0 81 FB 4C 53 11 A9 95
0A21:20 81 FB 4E BF 11 B0 09 B6
0A29:E6 FB D0 02 E6 FC 4C 3F EC
0A31:11 C8 C0 08 B0 0E A5 FB 9D
0A39:18 69 21 85 FB 90 02 E6 3D
0A41:FC 4C 38 11 EE 54 12 AD 99
0A49:C4 11 18 69 08 8D C4 11 AE
0A51:90 03 EE C3 11 EE C5 11 69
0A59:AD C5 11 C9 05 B0 03 4C B1
0A61:D1 10 A9 00 8D C5 11 AD EA
0A69:55 12 8D 54 12 EE 52 12 A6
0A71:AD C4 11 18 69 18 8D C4 BC
0A79:11 90 03 EE C3 11 EE C3 8D
0A81:11 EE 4A 12 AD 4A 12 C9 C8
0A89:03 B0 03 4C D1 10 60 00 FF
0A91:00 00 00 00 00 00 AD 18 19
0A99:D0 29 0F 09 10 8D 18 D0 8A
0AA1:A9 00 8D 4B 12 60 AE 53 B3
0AA9:12 AC 55 12 60 8E 53 12 B3
0AB1:8C 55 12 60 20 D6 11 AD D5
0AB9:53 12 38 E9 01 8D 53 12 98
0AC1:AD 53 12 C9 FF D0 03 20 C9
0AC9:DD 11 4C AF 10 20 D6 11 55
0AD1:AD 53 12 18 69 01 8D 53 13
0AD9:12 AD 53 12 C9 17 90 03 BC
0AE1:20 DD 11 4C AF 10 20 D6 39
0AE9:11 AD 55 12 38 E9 01 8D B6
0AF1:55 12 AD 55 12 C9 FF D0 C8
0AF9:03 20 DD 11 4C AF 10 20 C5
0B01:D6 11 AD 55 12 18 69 01 96
0B09:8D 55 12 AD 55 12 C9 24 03
0B11:90 03 20 DD 11 4C AF 10 3B
0B19:00 00 00 00 AD 55 12 8D A3
0B21:54 12 00 00 00 00 FF FF E5
0B29:F8 80 00 08 80 00 08 80 F0
0B31:00 08 80 00 08 80 00 08 A3
0B39:80 00 08 80 00 08 80 00 B9
0B41:08 80 00 08 80 00 08 80 90
0B49:00 08 FF FF F8 00 00 00 29
0B51:00 00 00 00 00 00 00 00 67
0B59:00 00 00 00 00 00 00 00 6F
0B61:00 00 00 00 00 00 00 00 77
0B69:00 00 00 00 00 00 A0 00 C0
0B71:B9 56 12 99 00 0C C8 C0 58
0B79:40 90 F5 AD 15 D0 09 80 EB
0B81:8D 15 D0 A9 30 8D FF 07 17
0B89:8D FF 0B AD 17 D0 09 80 31
0B91:8D 17 D0 AD 1D D0 09 80 E7
0B99:8D 1D D0 AD 1B D0 09 80 61
0BA1:8D 1B D0 60 AC 21 D0 C8 B9
0BA9:8C 2E D0 AE 53 12 A9 31 FD
0BB1:8D 39 13 E0 00 F0 0D AD D8
0BB9:39 13 18 69 08 8D 39 13 C6
0BC1:CA 4C E3 12 AD 39 13 8D F3
0BC9:0F D0 A9 17 8D 3A 13 A9 67
0BD1:00 8D 3B 13 AE 55 12 E0 B3
0BD9:00 F0 12 AD 3A 13 18 69 01
0BE1:08 8D 3A 13 90 03 EE 3B 81
0BE9:13 CA 4C 07 13 AD 3A 13 0D
0BF1:8D 0E D0 AD 3B 13 F0 08 57
0BF9:AD 10 D0 09 80 4C 35 13 48
0C01:AD 10 D0 29 7F 8D 10 D0 C3
0C09:60 00 00 00 00 00 00 00 51
0C11:00 A2 00 BD 52 13 F0 07 75
0C19:9D C0 0B E8 4C 43 13 4C 02
0C21:92 10 10 12 0F 07 12 01 63
0C29:0D 20 02 19 20 12 0F 02 0B
0C31:05 12 14 20 02 09 18 02 3B
0C39:19 00 00 00 00 00 00 00 DD
```

Easy LoaDIR

Article on page 78.

```
MC 10 REM COPYRIGHT 1988 COMPU
      TE! PUBLICATIONS -- ALL
      {SPACE}RIGHTS RESERVED
SG 20 PRINT"{CLR}PLEASE WAIT:"
CB 30 PRINT"{4 DOWN}"TAB(14)"E
      ASY LOA{RVS}DIR"
MS 40 PRINT"{2 DOWN}
      {12 SPACES}COPYRIGHT 198
      8"
KX 45 PRINT"{DOWN}{7 SPACES}CO
      MPUTE! PUBLICATIONS, INC
      ."
QP 50 PRINT"{DOWN}"TAB(11)"ALL
       RIGHTS RESERVED"
JQ 60 REM READ AND STORE MACHI
      NE LANGUAGE DATA
CE 70 FORAD=52736TO53152:READD
      T:POKEAD,DT:X=X+DT:IFAD=
      52803THENX=X-DT
SA 80 PRINTCHR$(19);TAB(13);RI
      GHT$("00"+MID$(STR$(5315
      2-AD),2),3)
AR 90 NEXTAD:IFX<>45626THENPRI
      NT"DATA STATEMENT ERROR.
      ":STOP
MQ 100 REM INSTALL PROGRAM WED
       GE AND END
KF 110 SYS52736:END
FE 120 REM MACHINE LANGUAGE DA
       TA
MR 130 DATA 238,33,208,173,0,3
       ,201,50
JJ 140 DATA 208,7,173,1,3,201,
       206,240
MR 150 DATA 22,173,0,3,141,62,
       206,173
FG 160 DATA 1,3,141,63,206,169
       ,50,141
PE 170 DATA 0,3,169,206,141,1,
       3,169
JA 180 DATA 45,160,207,32,30,1
       71,206,33
SE 190 DATA 208,96,224,11,208,
       7,32,121
RJ 200 DATA 0,201,36,240,3,76,
       139,227
RC 210 DATA 104,104,162,8,32,1
       15,0,240
PE 220 DATA 16,32,158,183,224,
       8,240,9
AK 230 DATA 224,9,240,5,162,14
       ,76,55
SQ 240 DATA 164,142,161,207,32
       ,98,206,76
BS 250 DATA 6,169,169,2,162,15
       9,160,207
KB 260 DATA 32,189,255,169,1,1
       74,161,207
XA 270 DATA 160,0,32,186,255,3
       2,192,255
JK 280 DATA 32,183,255,201,0,2
       08,77,162
FJ 290 DATA 1,32,198,255,32,22
       8,255,32
KH 300 DATA 228,255,169,13,32,
       210,255,165
GE 310 DATA 145,16,57,32,204,2
       55,32,228
HD 320 DATA 255,201,32,208,7,3
       2,228,255
GS 330 DATA 201,0,240,249,169,
       1,141,162
MX 340 DATA 207,162,145,160,20
       7,32,26,207
EF 350 DATA 162,1,32,198,255,3
       2,228,255
XJ 360 DATA 32,228,255,32,228,
       255,133,57
SG 370 DATA 32,228,255,133,58,
       32,183,255
AG 380 DATA 201,0,240,18,169,2
       55,133,58
QQ 390 DATA 32,204,255,169,13,
       32,210,255
JK 400 DATA 169,1,32,195,255,9
       6,32,201
CR 410 DATA 189,162,149,160,20
       7,32,26,207
EQ 420 DATA 32,228,255,201,0,2
       40,155,72
ED 430 DATA 32,210,255,104,201
       ,34,208,240
BQ 440 DATA 169,0,133,212,206,
       162,207,240
PJ 450 DATA 231,169,0,133,199,
       169,48,13
AQ 460 DATA 161,207,141,154,20
       7,162,153,160
KR 470 DATA 207,32,26,207,32,2
       28,255,76
SC 480 DATA 232,206,173,134,2,
       72,173,33
KR 490 DATA 208,141,134,2,138,
       32,30,171
CR 500 DATA 104,141,134,2,96,1
       47,32,32
FF 510 DATA 32,32,32,32,32,32,
       32,32
SC 520 DATA 32,32,32,32,69,65,
       83,89
KK 530 DATA 32,76,79,65,18,68,
       73,82
RA 540 DATA 13,13,32,32,32,67,
       79,80
RG 550 DATA 89,82,73,71,72,84,
       32,49
RG 560 DATA 57,56,56,32,67,79,
       77,80
CD 570 DATA 85,84,69,33,32,80,
       85,66
QK 580 DATA 76,46,44,32,73,78,
       67,46
SD 590 DATA 13,32,32,32,32,32,
       32,32
CS 600 DATA 32,32,32,65,76,76,
       32,82
DR 610 DATA 73,71,72,84,83,32,
       82,69
RC 620 DATA 83,69,82,86,69,68,
       13,13
JM 630 DATA 0,32,68,193,0,58,7
       6,207
DH 640 DATA 0,44,56,44,49,58,0
       ,36,48
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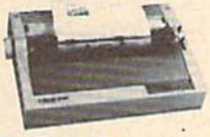

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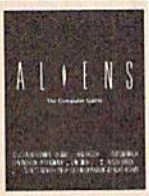

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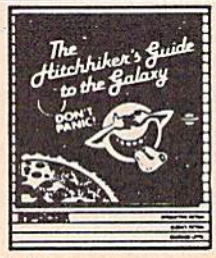

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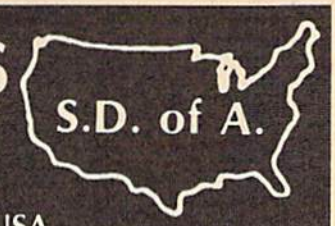

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MLX Machine Language Entry Program For Commodore 64 and 128

Ottis R. Cowper

"MLX" is a labor-saving utility that allows almost fail-safe entry of machine language programs. Included are versions for the Commodore 64 and 128.

Type in and save some copies of whichever version of MLX is appropriate for your computer (you'll want to use it to enter future ML programs from COMPUTE!'s GAZETTE). Program 1 is for the Commodore 64, and Program 2 is for the 128 (128 MLX can also be used to enter Commodore 64 ML programs for use in 64 mode). When you're ready to enter an ML program, load and run MLX. It asks you for a starting address and an ending address. These addresses appear in the article accompanying the MLX-format program listing you're typing.

If you're unfamiliar with machine language, the addresses (and all other values you enter in MLX) may appear strange. Instead of the usual decimal numbers you're accustomed to, these numbers are in *hexadecimal*—a base 16 numbering system commonly used by ML programmers. Hexadecimal—hex for short—includes the numerals 0–9 and the letters A–F. But don't worry—even if you know nothing about ML or hex, you should have no trouble using MLX.

After you enter the starting and ending addresses, you'll be offered the option of clearing the workspace. Choose this option if you're starting to enter a new listing. If you're continuing a listing that's partially typed from a previous session, don't choose this option.

A functions menu will appear. The first option in the menu is ENTER DATA. If you're just starting to type in a program, pick this. Press the E key, and type the first number in the first line of the program listing. If you've already typed in part of a program, type the line number where you left off typing at the end of the previous session (be sure to load the partially completed program before you resume entry). In any case, make sure the address you enter corresponds to the address of a line in the listing you are entering. Otherwise, you'll be unable to enter the data correctly. If you pressed E by mistake, you can return to the command menu by pressing RETURN alone when asked for the address. (You can get back to the menu from most options by pressing RETURN with no other input.)

Entering A Listing

Once you're in Enter mode, MLX prints the address for each program line for you. You then type in all nine numbers on that line, beginning with the first two-digit number after the colon (:). Each line represents eight data bytes and a checksum. Although an MLX-format listing appears similar to the "hex dump" listings from a machine language monitor program, the extra checksum number on the end allows MLX to check your typing. (Commodore 128 users *can* enter the data from an MLX listing using the built-in monitor if the rightmost column of data is omitted, but we recommend against it. It's much easier to let MLX do the proofreading and error checking for you.)

When you enter a line, MLX recalculates the checksum from the eight bytes and the address and compares this value to the number from the ninth column. If the values match, you'll hear a bell tone, the data will be added to the workspace area, and the prompt for the next line of data will appear. But if MLX detects a typing error, you'll hear a low buzz and see an error message. The line will then be redisplayed for editing.

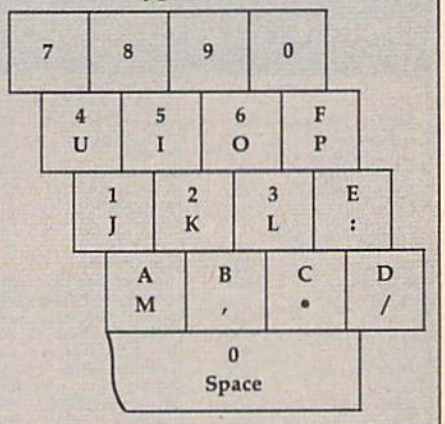
Invalid Characters Banned

Only a few keys are active while you're entering data, so you may have to unlearn some habits. You *do not* type spaces between the columns; MLX automatically inserts these for you. You *do not* press RETURN after typing the last number in a line; MLX automatically enters and checks the line after you type the last digit.

Only the numerals 0–9 and the letters A–F can be typed in. If you press any other key (with some exceptions noted below), you'll hear a warning buzz. To simplify typing, 128 MLX redefines the function keys and + and − keys on the numeric keypad so that you can enter data one-handed. (The 64 version incorporates the keypad modification from the March 1986 "Bug-Swatter" column, lines 485–487.) In either case, the keypad is active only while entering data. Addresses must be entered with the normal letter and number keys. The figures above show the keypad configurations for each version.

MLX checks for transposed characters. If you're supposed to type in A0 and instead enter 0A, MLX will catch your mistake. There is one error that can slip past MLX: Because of the checksum formula used, MLX won't notice if you accidentally type FF in place of 00, and vice versa. And there's a very slim chance that you could garble a line and still end up with a combination of characters that adds up to the proper checksum. However, these mistakes should not occur if you take reasonable care while entering data.

64 MLX Keypad



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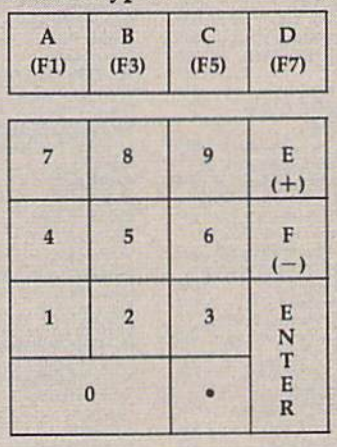

Editing Features

To correct typing mistakes before finishing a line, use the INST/DEL key to delete the character to the left of the cursor. (The cursor-left key also deletes.) If you mess up a line really badly, press CLR/HOME to start the line over. The RETURN key is also active, but only before any data is typed on a line. Pressing RETURN at this point returns you to the command menu. After you type a character of data, MLX disables RETURN until the cursor returns to the start of a line. Remember, you can press CLR/HOME to quickly get to a line

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number prompt.

More editing features are available when correcting lines in which MLX has detected an error. To make corrections in a line that MLX has redisplayed for editing, compare the line on the screen with the one printed in the listing, then move the cursor to the mistake and type the correct key. The cursor left and right keys provide the normal cursor controls. (The INST/DEL key now works as an alternative cursor-left key.) You cannot move left beyond the first character in the line. If you try to move beyond the rightmost character, you'll reenter the line. During editing, RETURN is active; pressing it tells MLX to recheck the line. You can press the CLR/HOME key to clear the entire line if you want to start from scratch, or if you want to get to a line number prompt to use RETURN to get back to the menu.

Display Data

The second menu choice, DISPLAY DATA, examines memory and shows the contents in the same format as the program listing (including the checksum). When you press D, MLX asks you for a starting address. Be sure that the starting address you give corresponds to a line number in the listing. Otherwise, the checksum display will be meaningless. MLX displays program lines until it reaches the end of the program, at which point the menu is redisplayed. You can pause the display by pressing the space bar. (MLX finishes printing the current line before halting.) Press space again to restart the display. To break out of the display and get back to the menu before the ending address is reached, press RETURN.

Other Menu Options

Two more menu selections let you save programs and load them back into the computer. These are SAVE FILE and LOAD FILE; their operation is quite straightforward. When you press S or L, MLX asks you for the filename. You'll then be asked to press either D or T to select disk or tape.

You'll notice the disk drive starting and stopping several times during a load or save (save only for the 128 version). Don't panic; this is normal behavior. MLX opens and reads from or writes to the file instead of using the usual LOAD and SAVE commands (128 MLX makes use of BLOAD). Disk users should also note that the drive prefix 0: is automatically added to the filename (line 750 in 64 MLX), so this should *not* be included when entering the name. This also precludes the use of @ for Save-with-Replace, so remember to give each version you save a different name. The 128 version makes up for this by giving you the option of scratching the existing file if you want to reuse a filename.

Remember that MLX saves the entire workspace area from the starting address to the ending address, so the save or load may take longer than you might expect if you've entered only a small amount of data from a long listing. When saving a partially completed listing, make sure to note the address where you stopped typing so you'll know where to resume entry when you reload.

MLX reports the standard disk or tape error messages if any problems are detected during the save or load. (Tape users should bear in mind that Commodore computers are never able to detect errors during a save to tape.) MLX also has three special load error messages: INCORRECT STARTING ADDRESS, which means the file you're trying to load does not have the starting address you specified when you ran MLX; LOAD ENDED AT *address*, which means the file you're trying to load ends before the ending address you specified when you started MLX; and TRUNCATED AT ENDING ADDRESS, which means the file you're trying to load extends beyond the ending address you specified when you started MLX. If you see one of these messages and feel certain that you've loaded the right file, exit and rerun MLX, being careful to enter the correct starting and ending addresses.

The 128 version also has a CATALOG DISK option so you can view the contents of the disk directory before saving or loading.

The QUIT menu option has the obvious effect—it stops MLX and enters BASIC. The RUN/STOP key is disabled, so the Q option lets you exit the program without turning off the computer. (Of course, RUN/STOP-RESTORE also gets you out.) You'll be asked for verification; press Y to exit to BASIC, or any other key to return to the menu. After quitting, you can type RUN again and reenter MLX without losing your data, as long as you don't use the clear workspace option.

The Finished Product

When you've finished typing all the data for an ML program and saved your work, you're ready to see the results. The instructions for loading and using the finished product vary from program to program. Some ML programs are designed to be loaded and run like BASIC programs, so all you need to type is LOAD *"filename"*,8 for disk (DLOAD *"filename"* on the 128) or LOAD *"filename"* for tape, and then RUN. Such programs will usually have a starting address of 0801 for the 64 or 1C01 for the 128. Other programs must be reloaded to specific addresses with a command such as LOAD *"filename"*,8,1 for disk (BLOAD *"filename"* on the 128) or LOAD *"filename"*,1,1 for tape, then started with a SYS to a particular memory address. On the Commodore 64, the most common starting address for such programs is 49152, which corresponds to MLX address C000. In either case, you should always refer to the article which accompanies the ML listing for information on loading and running the program.

An Ounce Of Prevention

By the time you finish typing in the data for a long ML program, you may have several hours invested in the project. Don't take chances—use our "Automatic Proofreader" to type the new MLX, and then test your copy *thoroughly* before first using it to enter any significant amount of data. Make sure all the menu options work as they should. Enter fragments of the program starting at several different addresses, then use the Display option to verify that the data has been entered correctly. And be sure to test the Save and Load options several times to ensure that you can recall your work from disk or tape. Don't let a simple typing error in the new MLX cost you several nights of hard work.

Program 1: MLX For Commodore 64

```
SS 10 REM VERSION 1.1: LINES 8
      30,950 MODIFIED, LINES 4
      85-487 ADDED
EK 100 POKE 56,50:CLR:DIM IN$,
      I,J,A,B,A$,B$,A(7),N$
DM 110 C4=48:C6=16:C7=7:Z2=2:Z
      4=254:Z5=255:Z6=256:Z7=
      127
CJ 120 FA=PEEK(45)+Z6*PEEK(46)
      :BS=PEEK(55)+Z6*PEEK(56
      ):H$="0123456789ABCDEF"
SB 130 R$=CHR$(13):L$="{LEFT}"
      :S$=" ":D$=CHR$(20):Z$=
      CHR$(0):T$="{13 RIGHT}"
CQ 140 SD=54272:FOR I=SD TO SD
      +23:POKE I,0:NEXT:POKE
      {SPACE}SD+24,15:POKE 78
      8,52
FC 150 PRINT"{CLR}"CHR$(142)CH
      R$(8):POKE 53280,15:POK
      E 53281,15
EJ 160 PRINT T$" {RED}{RVS}
      {2 SPACES}{8 @}
      {2 SPACES}"SPC(28)"
      {2 SPACES}{OFF}{BLU} ML
      X II {RED}{RVS}
      {2 SPACES}"SPC(28)"
      {12 SPACES}{BLU}"
FR 170 PRINT"{3 DOWN}
      {3 SPACES}COMPUTE!'S MA
      CHINE LANGUAGE EDITOR
      {3 DOWN}"
JB 180 PRINT"{BLK}STARTING ADD
```

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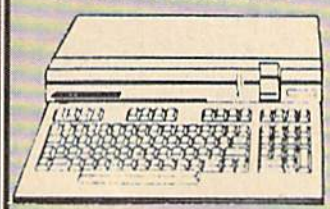

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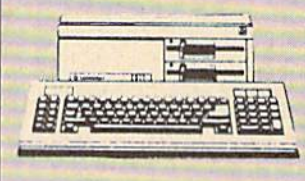

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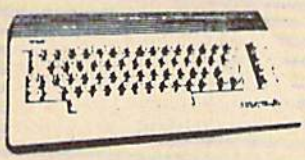
Commodore 64C



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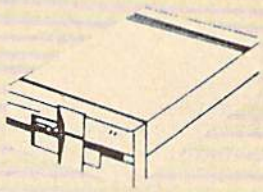

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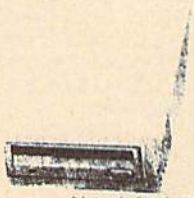

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```
      RESS[4]";:GOSUB300:SA=A
      D:GOSUB1040:IF F THEN18
      0
GF 190 PRINT"{BLK}{2 SPACES}EN
      DING ADDRESS[4]";:GOSUB
      300:EA=AD:GOSUB1030:IF
      {SPACE}F THEN190
KR 200 INPUT"{3 DOWN}{BLK}CLEA
      R WORKSPACE [Y/N][4]";A
      $:IF LEFT$(A$,1)<>"Y"TH
      EN220
PG 210 PRINT"{2 DOWN}{BLU}WORK
      ING...";:FORI=BS TO BS+
      EA-SA+7:POKE I,0:NEXT:P
      RINT"DONE"
DR 220 PRINTTAB(10)"{2 DOWN}
      {BLK}{RVS} MLX COMMAND
      {SPACE}MENU {DOWN}[4]":
      PRINT T$"{RVS}E{OFF}NTE
      R DATA"
BD 230 PRINT T$"{RVS}D{OFF}ISP
      LAY DATA":PRINT T$"
      {RVS}L{OFF}OAD FILE"
JS 240 PRINT T$"{RVS}S{OFF}AVE.
       FILE":PRINT T$"{RVS}Q
      {OFF}UIT{2 DOWN}{BLK}"
JH 250 GET A$:IF A$=N$ THEN250
HK 260 A=0:FOR I=1 TO 5:IF A$=
      MID$("EDLSQ",I,1)THEN A
      =I:I=5
FD 270 NEXT:ON A GOTO420,610,6
      90,700,280:GOSUB1060:GO
      TO250
EJ 280 PRINT"{RVS} QUIT ":INPU
      T"{DOWN}[4]ARE YOU SURE
       [Y/N]";A$:IF LEFT$(A$,
      1)<>"Y"THEN220
EM 290 POKE SD+24,0:END
JX 300 IN$=N$:AD=0:INPUTIN$:IF
      LEN(IN$)<>4THENRETURN
KF 310 B$=IN$:GOSUB320:AD=A:B$
      =MID$(IN$,3):GOSUB320:A
      D=AD*256+A:RETURN
PP 320 A=0:FOR J=1 TO 2:A$=MID
      $(B$,J,1):B=ASC(A$)-C4+
      (A$>"@")*C7:A=A*C6+B
JA 330 IF B<0 OR B>15 THEN AD=
      0:A=-1:J=2
GX 340 NEXT:RETURN
CH 350 B=INT(A/C6):PRINT MID$(
      H$,B+1,1);:B=A-B*C6:PRI
      NT MID$(H$,B+1,1);:RETU
      RN
RR 360 A=INT(AD/Z6):GOSUB350:A
      =AD-A*Z6:GOSUB350:PRINT
      ":";
BE 370 CK=INT(AD/Z6):CK=AD-Z4*
      CK+Z5*(CK>Z7):GOTO390
PX 380 CK=CK*Z2+Z5*(CK>Z7)+A
JC 390 CK=CK+Z5*(CK>Z5):RETURN
QS 400 PRINT"{DOWN}STARTING AT
      [4]";:GOSUB300:IF IN$<>
      N$ THEN GOSUB1030:IF F
      {SPACE}THEN400
EX 410 RETURN
HD 420 PRINT"{RVS} ENTER DATA
      {SPACE}":GOSUB400:IF IN
      $=N$ THEN220
JK 430 OPEN3,3:PRINT
SK 440 POKE198,0:GOSUB360:IF F
       THEN PRINT IN$:PRINT"
      {UP}{5 RIGHT}";
GC 450 FOR I=0 TO 24 STEP 3:B$
      =S$:FOR J=1 TO 2:IF F T
      HEN B$=MID$(IN$,I+J,1)
HA 460 PRINT"{RVS}"B$L$;:IF I<
      24THEN PRINT"{OFF}";
HD 470 GET A$:IF A$=N$ THEN470
FK 480 IF(A$>"/"ANDA$<":")OR(A
      $>"@"ANDA$<"G")THEN540
GS 485 A=-(A$="M")-2*(A$=",")-
      3*(A$=".")-4*(A$="/")-5
      *(A$="J")-6*(A$="K")
FX 486 A=A-7*(A$="L")-8*(A$=":
      ")-9*(A$="U")-10*(A$="I
      ")-11*(A$="O")-12*(A$="
      P")
CM 487 A=A-13*(A$=S$):IF A THE
      N A$=MID$("ABCD123E456F
      0",A,1):GOTO 540
MP 490 IF A$=R$ AND((I=0)AND(J
      =1)OR F)THEN PRINT B$;:
      J=2:NEXT:I=24:GOTO550
KC 500 IF A$="{HOME}" THEN PRI
      NT B$:J=2:NEXT:I=24:NEX
      T:F=0:GOTO440
MX 510 IF(A$="{RIGHT}")ANDF TH
      ENPRINT B$L$;:GOTO540
GK 520 IF A$<>L$ AND A$<>D$ OR
      ((I=0)AND(J=1))THEN GOS
      UB1060:GOTO470
HG 530 A$=L$+S$+L$:PRINT B$L$;
      :J=2-J:IF J THEN PRINT
      {SPACE}L$;:I=I-3
QS 540 PRINT A$;:NEXT J:PRINT
      {SPACE}S$;
PM 550 NEXT I:PRINT:PRINT"{UP}
      {5 RIGHT}";:INPUT#3,IN$
      :IF IN$=N$ THEN CLOSE3:
      GOTO220
QC 560 FOR I=1 TO 25 STEP3:B$=
      MID$(IN$,I):GOSUB320:IF
       I<25 THEN GOSUB380:A(I
      /3)=A
PK 570 NEXT:IF A<>CK THEN GOSU
      B1060:PRINT"{BLK}{RVS}
      {SPACE}ERROR: REENTER L
      INE [4]":F=1:GOTO440
HJ 580 GOSUB1080:B=BS+AD-SA:FO
      R I=0 TO 7:POKE B+I,A(I
      ):NEXT
QQ 590 AD=AD+8:IF AD>EA THEN C
      LOSE3:PRINT"{DOWN}{BLU}
      ** END OF ENTRY **{BLK}
      {2 DOWN}":GOTO700
GQ 600 F=0:GOTO440
QA 610 PRINT"{CLR}{DOWN}{RVS}
      {SPACE}DISPLAY DATA ":G
      OSUB400:IF IN$=N$ THEN2
      20
RJ 620 PRINT"{DOWN}{BLU}PRESS:
       {RVS}SPACE{OFF} TO PAU
      SE, {RVS}RETURN{OFF} TO
       BREAK[4]{DOWN}"
KS 630 GOSUB360:B=BS+AD-SA:FOR
      I=BTO B+7:A=PEEK(I):GOS
      UB350:GOSUB380:PRINT S$
      ;
CC 640 NEXT:PRINT"{RVS}";:A=CK
      :GOSUB350:PRINT
KH 650 F=1:AD=AD+8:IF AD>EA TH
      ENPRINT"{DOWN}{BLU}** E
      ND OF DATA **":GOTO220
KC 660 GET A$:IF A$=R$ THEN GO
      SUB1080:GOTO220
EQ 670 IF A$=S$ THEN F=F+1:GOS
      UB1080
AD 680 ONFGOTO630,660,630
CM 690 PRINT"{DOWN}{RVS} LOAD
      {SPACE}DATA ":OP=1:GOTO
      710
PC 700 PRINT"{DOWN}{RVS} SAVE
      {SPACE}FILE ":OP=0
RX 710 IN$=N$:INPUT"{DOWN}FILE
      NAME[4]";IN$:IF IN$=N$
      {SPACE}THEN220
PR 720 F=0:PRINT"{DOWN}{BLK}
      {RVS}T{OFF}APE OR {RVS}
      D{OFF}ISK: [4]";
FP 730 GET A$:IF A$="T"THEN PR
      INT"T{DOWN}":GOTO880
HQ 740 IF A$<>"D"THEN730
HH 750 PRINT"D{DOWN}":OPEN15,8
      ,15,"I0:":B=EA-SA:IN$="
      0:"+IN$:IF OP THEN810
SQ 760 OPEN 1,8,8,IN$+",P,W":G
      OSUB860:IF A THEN220
FJ 770 AH=INT(SA/256):AL=SA-(A
      H*256):PRINT#1,CHR$(AL)
      ;CHR$(AH);
PE 780 FOR I=0 TO B:PRINT#1,CH
      R$(PEEK(BS+I));:IF ST T
      HEN800
FC 790 NEXT:CLOSE1:CLOSE15:GOT
      O940
GS 800 GOSUB1060:PRINT"{DOWN}
      {BLK}ERROR DURING SAVE:
      [4]":GOSUB860:GOTO220
MA 810 OPEN 1,8,8,IN$+",P,R":G
      OSUB860:IF A THEN220
GE 820 GET#1,A$,B$:AD=ASC(A$+Z
      $)+256*ASC(B$+Z$):IF AD
      <>SA THEN F=1:GOTO850
RX 830 FOR I=0 TO B:GET#1,A$:P
      OKE BS+I,ASC(A$+Z$):IF(
      I<>B)AND ST THEN F=2:AD
      =I:I=B
FA 840 NEXT:IF ST<>64 THEN F=3
FQ 850 CLOSE1:CLOSE15:ON ABS(F
      >0)+1 GOTO960,970
SA 860 INPUT#15,A,A$:IF A THEN
       CLOSE1:CLOSE15:GOSUB10
      60:PRINT"{RVS}ERROR: "A
      $
GQ 870 RETURN
EJ 880 POKE183,PEEK(FA+2):POKE
      187,PEEK(FA+3):POKE188,
      PEEK(FA+4):IFOP=0THEN92
      0
HJ 890 SYS 63466:IF(PEEK(783)A
      ND1)THEN GOSUB1060:PRIN
      T"{DOWN}{RVS} FILE NOT
      {SPACE}FOUND ":GOTO690
CS 900 AD=PEEK(829)+256*PEEK(8
      30):IF AD<>SA THEN F=1:
      GOTO970
SC 910 A=PEEK(831)+256*PEEK(83
      2)-1:F=F-2*(A<EA)-3*(A>
      EA):AD=A-AD:GOTO930
KM 920 A=SA:B=EA+1:GOSUB1010:P
      OKE780,3:SYS 63338
JF 930 A=BS:B=BS+(EA-SA)+1:GOS
      UB1010:ON OP GOTO950:SY
      S 63591
AE 940 GOSUB1080:PRINT"{BLU}**
       SAVE COMPLETED **":GOT
      O220
XP 950 POKE147,0:SYS 63562:IF
      {SPACE}ST>0 THEN970
FR 960 GOSUB1080:PRINT"{BLU}**
       LOAD COMPLETED **":GOT
      O220
DP 970 GOSUB1060:PRINT"{BLK}
      {RVS}ERROR DURING LOAD:
      {DOWN}[4]":ON F GOSUB98
      0,990,1000:GOTO220
PP 980 PRINT"INCORRECT STARTIN
      G ADDRESS (";:GOSUB360:
      PRINT")":RETURN
GR 990 PRINT"LOAD ENDED AT ";:
      AD=SA+AD:GOSUB360:PRINT
       D$:RETURN
FD 1000 PRINT"TRUNCATED AT END
      ING ADDRESS":RETURN
RX 1010 AH=INT(A/256):AL=A-(AH
      *256):POKE193,AL:POKE1
      94,AH
FF 1020 AH=INT(B/256):AL=B-(AH
      *256):POKE174,AL:POKE1
      75,AH:RETURN
FX 1030 IF AD<SA OR AD>EA THEN
       1050
HA 1040 IF(AD>511 AND AD<40960
```

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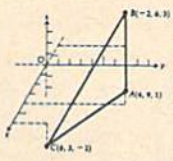

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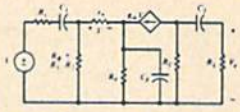

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```
        )OR(AD>49151 AND AD<53
        248)THEN GOSUB1080:F=0
        :RETURN
HC 1050 GOSUB1060:PRINT"{RVS}
        {SPACE}INVALID ADDRESS
         {DOWN}{BLK}":F=1:RETU
        RN
AR 1060 POKE SD+5,31:POKE SD+6
        ,208:POKE SD,240:POKE
        {SPACE}SD+1,4:POKE SD+
        4,33
DX 1070 FOR S=1 TO 100:NEXT:GO
        TO1090
PF 1080 POKE SD+5,8:POKE SD+6,
        240:POKE SD,0:POKE SD+
        1,90:POKE SD+4,17
AC 1090 FOR S=1 TO 100:NEXT:PO
        KE SD+4,0:POKE SD,0:PO
        KE SD+1,0:RETURN
```

Program 2: MLX For Commodore 128

```
AE 100 TRAP 960:POKE 4627,128:
       DIM NL$,A(7)
XP 110 Z2=2:Z4=254:Z5=255:Z6=2
       56:Z7=127:BS=256*PEEK(4
       627):EA=65280
FB 120 BE$=CHR$(7):RT$=CHR$(13
       ):DL$=CHR$(20):SP$=CHR$
       (32):LF$=CHR$(157)
KE 130 DEF FNHB(A)=INT(A/256):
       DEF FNLB(A)=A-FNHB(A)*2
       56:DEF FNAD(A)=PEEK(A)+
       256*PEEK(A+1)
JB 140 KEY 1,"A":KEY 3,"B":KEY
        5,"C":KEY 7,"D":VOL 15
       :IF RGR(0)=5 THEN FAST
FJ 150 PRINT"{CLR}"CHR$(142);C
       HR$(8):COLOR 0,15:COLOR
        4,15:COLOR 6,15
GQ 160 PRINT TAB(12)"{RED}
       {RVS}{2 SPACES}{9 @}
       {2 SPACES}"RT$;TAB(12)"
       {RVS}{2 SPACES}{OFF}
       {BLU} 128 MLX {RED}
       {RVS}{2 SPACES}"RT$;TAB
       (12)"{RVS}{13 SPACES}
       {BLU}"
FE 170 PRINT"{2 DOWN}
       {3 SPACES}COMPUTE!'S MA
       CHINE LANGUAGE EDITOR
       {2 DOWN}"
DK 180 PRINT"{BLK}STARTING ADD
       RESS{4}";:GOSUB 260:IF
       {SPACE}AD THEN SA=AD:EL
       SE 180
FH 190 PRINT"{BLK}{2 SPACES}EN
       DING ADDRESS{4}";:GOSUB
        260:IF AD THEN EA=AD:E
       LSE 190
MF 200 PRINT"{DOWN}{BLK}CLEAR
       {SPACE}WORKSPACE [Y/N]?
       {4}":GETKEY A$:IF A$<>"
       Y" THEN 220
QH 210 PRINT"{DOWN}{BLU}WORKIN
       G...";:BANK 0:FOR A=BS
       {SPACE}TO BS+(EA-SA)+7:
       POKE A,0:NEXT A:PRINT"D
       ONE"
DC 220 PRINT TAB(10)"{DOWN}
       {BLK}{RVS} MLX COMMAND
       {SPACE}MENU {4}{DOWN}":
       PRINT TAB(13)"{RVS}E
       {OFF}NTER DATA"RT$;TAB(
       13)"{RVS}D{OFF}ISPLAY D
       ATA"RT$;TAB(13)"{RVS}L
       {OFF}OAD FILE"
HB 230 PRINT TAB(13)"{RVS}S
       {OFF}AVE FILE"RT$;TAB(1
       3)"{RVS}C{OFF}ATALOG DI
       SK"RT$;TAB(13)"{RVS}Q
       {OFF}UIT{DOWN}{BLK}"
AP 240 GETKEY A$:A=INSTR("EDLS
       CQ",A$):ON A GOTO 340,5
       50,640,650,930,940:GOSU
       B 950:GOTO 240
SX 250 PRINT"STARTING AT";:GOS
       UB 260:IF(AD<>0)OR(A$=N
       L$)THEN RETURN:ELSE 250
BG 260 A$=NL$:INPUT A$:IF LEN(
       A$)=4 THEN AD=DEC(A$)
PP 270 IF AD=0 THEN BEGIN:IF A
       $<>NL$ THEN 300:ELSE RE
       TURN:BEND
MA 280 IF AD<SA OR AD>EA THEN
       {SPACE}300
PM 290 IF AD>511 AND AD<65280
       {SPACE}THEN PRINT BE$;:
       RETURN
SQ 300 GOSUB 950:PRINT"{RVS} I
       NVALID ADDRESS {DOWN}
       {BLK}":AD=0:RETURN
RD 310 CK=FNHB(AD):CK=AD-Z4*CK
       +Z5*(CK>Z7):GOTO 330
DD 320 CK=CK*Z2+Z5*(CK>Z7)+A
AH 330 CK=CK+Z5*(CK>Z5):RETURN
QD 340 PRINT BE$;"{RVS} ENTER
       {SPACE}DATA ":GOSUB 250
       :IF A$=NL$ THEN 220
JA 350 BANK 0:PRINT:F=0:OPEN 3
       ,3
BR 360 GOSUB 310:PRINT HEX$(AD
       )+":";:IF F THEN PRINT
       {SPACE}L$:PRINT"{UP}
       {5 RIGHT}";
QA 370 FOR I=0 TO 24 STEP 3:B$
       =SP$:FOR J=1 TO 2:IF F
       {SPACE}THEN B$=MID$(L$,
       I+J,1)
PS 380 PRINT"{RVS}"B$+LF$;:IF
       {SPACE}I<24 THEN PRINT"
       {OFF}";
RC 390 GETKEY A$:IF (A$>"/" AN
       D A$<":") OR(A$>"@" AND
        A$<"G") THEN 470
AC 400 IF A$="+" THEN A$="E":G
       OTO 470
QB 410 IF A$="-" THEN A$="F":G
       OTO 470
FB 420 IF A$=RT$ AND ((I=0) AN
       D (J=1) OR F) THEN PRIN
       T B$;:J=2:NEXT:I=24:GOT
       O 480
RD 430 IF A$="{HOME}" THEN PRI
       NT B$:J=2:NEXT:I=24:NEX
       T:F=0:GOTO 360
XB 440 IF (A$="{RIGHT}") AND F
        THEN PRINT B$+LF$;:GOT
       O 470
JP 450 IF A$<>LF$ AND A$<>DL$
       {SPACE}OR ((I=0) AND (J
       =1)) THEN GOSUB 950:GOT
       O 390
PS 460 A$=LF$+SP$+LF$:PRINT B$
       +LF$;:J=2-J:IF J THEN P
       RINT LF$;:I=I-3
GB 470 PRINT A$;:NEXT J:PRINT
       {SPACE}SP$;
HA 480 NEXT I:PRINT:PRINT"{UP}
       {5 RIGHT}";:L$="
       {27 SPACES}"
DP 490 FOR I=1 TO 25 STEP 3:GE
       T#3,A$,B$:IF A$=SP$ THE
       N I=25:NEXT:CLOSE 3:GOT
       O 220
BA 500 A$=A$+B$:A=DEC(A$):MID$
       (L$,I,2)=A$:IF I<25 THE
       N GOSUB 320:A(I/3)=A:GE
       T#3,A$
AR 510 NEXT I:IF A<>CK THEN GO
       SUB 950:PRINT:PRINT"
       {RVS} ERROR: REENTER LI
       NE ":F=1:GOTO 360
DX 520 PRINT BE$:B=BS+AD-SA:FO
       R I=0 TO 7:POKE B+I,A(I
       ):NEXT I
XB 530 F=0:AD=AD+8:IF AD<=EA T
       HEN 360
CA 540 CLOSE 3:PRINT"{DOWN}
       {BLU}** END OF ENTRY **
       {BLK}{2 DOWN}":GOTO 650
MC 550 PRINT BE$;"{CLR}{DOWN}
       {RVS} DISPLAY DATA ":GO
       SUB 250:IF A$=NL$ THEN
       {SPACE}220
JF 560 BANK 0:PRINT"{DOWN}
       {BLU}PRESS: {RVS}SPACE
       {OFF} TO PAUSE, {RVS}RE
       TURN{OFF} TO BREAK{4}
       {DOWN}"
XA 570 PRINT HEX$(AD)+":";:GOS
       UB 310:B=BS+AD-SA
DJ 580 FOR I=B TO B+7:A=PEEK(I
       ):PRINT RIGHT$(HEX$(A),
       2);SP$;:GOSUB 320:NEXT
       {SPACE}I
XB 590 PRINT"{RVS}";RIGHT$(HEX
       $(CK),2)
GR 600 F=1:AD=AD+8:IF AD>EA TH
       EN PRINT"{BLU}** END OF
        DATA **":GOTO 220
EB 610 GET A$:IF A$=RT$ THEN P
       RINT BE$:GOTO 220
QK 620 IF A$=SP$ THEN F=F+1:PR
       INT BE$;
XS 630 ON F GOTO 570,610,570
RF 640 PRINT BE$"{DOWN}{RVS} L
       OAD DATA ":OP=1:GOTO 66
       0
BP 650 PRINT BE$"{DOWN}{RVS} S
       AVE FILE ":OP=0
DM 660 F=0:F$=NL$:INPUT"FILENA
       ME{4}";F$:IF F$=NL$ THE
       N 220
PF 665 IF LEN(F$)>14 THEN 660
RF 670 PRINT"{DOWN}{BLK}{RVS}T
       {OFF}APE OR {RVS}D{OFF}
       ISK: {4}";
SQ 680 GETKEY A$:IF A$="T" THE
       N 850:ELSE IF A$<>"D" T
       HEN 680
SP 690 PRINT"DISK{DOWN}":IF OP
        THEN 760
EH 700 DOPEN#1,(F$+",P"),W:IF
       {SPACE}DS THEN A$=D$:GO
       TO 740
JH 710 BANK 0:POKE BS-2,FNLB(S
       A):POKE BS-1,FNHB(SA):P
       RINT"SAVING ";F$:PRINT
MC 720 FOR A=BS-2 TO BS+EA-SA:
       PRINT#1,CHR$(PEEK(A));:
       IF ST THEN A$="DISK WRI
       TE ERROR":GOTO 750
GC 730 NEXT A:CLOSE 1:PRINT"
       {BLU}** SAVE COMPLETED
       {SPACE}WITHOUT ERRORS *
       *":GOTO 220
RA 740 IF DS=63 THEN BEGIN:CLO
       SE 1:INPUT"{BLK}REPLACE
        EXISTING FILE [Y/N]{4}
       ";A$:IF A$="Y" THEN SCR
       ATCH(F$):PRINT:GOTO 700
       :ELSE PRINT"{BLK}":GOTO
        660:BEND
GA 750 CLOSE 1:GOSUB 950:PRINT
       "{BLK}{RVS} ERROR DURIN
       G SAVE: {4}":PRINT A$:G
       OTO 220
FD 760 DOPEN#1,(F$+",P"):IF DS
        THEN A$=DS$:F=4:CLOSE
       {SPACE}1:GOTO 790
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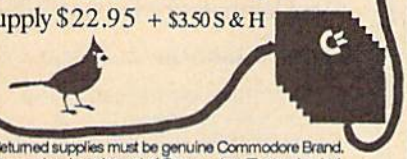

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```
PX 770 GET#1,A$,B$:CLOSE 1:AD=
       ASC(A$)+256*ASC(B$):IF
       {SPACE}AD<>SA THEN F=1:
       GOTO 790
KB 780 PRINT"LOADING ";F$:PRIN
       T:BLOAD(F$),B0,P(BS):AD
       =SA+FNAD(174)-BS-1:F=-2
       *(AD<EA)-3*(AD>EA)
RQ 790 IF F THEN 800:ELSE PRIN
       T"{BLU}** LOAD COMPLETE
       D WITHOUT ERRORS **":GO
       TO 220
ER 800 GOSUB 950:PRINT"{BLK}
       {RVS} ERROR DURING LOAD
       : [4]":ON F GOSUB 810,8
       20,830,840:GOTO220
QJ 810 PRINT"INCORRECT STARTIN
       G ADDRESS (";HEX$(AD);"
       )":RETURN
DP 820 PRINT"LOAD ENDED AT ";H
       EX$(AD):RETURN
EB 830 PRINT"TRUNCATED AT ENDI
       NG ADDRESS ("HEX$(EA)")
       ":RETURN
FP 840 PRINT"DISK ERROR ";A$:R
       ETURN
KS 850 PRINT"TAPE":AD=POINTER(
       F$):BANK 1:A=PEEK(AD):A
       L=PEEK(AD+1):AH=PEEK(AD
       +2)
XX 860 BANK 15:SYS DEC("FF68")
       ,0,1:SYS DEC("FFBA"),1,
       1,0:SYS DEC("FFBD"),A,A
       L,AH:SYS DEC("FF90"),12
       8:IF OP THEN 890
FG 870 PRINT:A=SA:B=EA+1:GOSUB
        920:SYS DEC("E919"),3:
       PRINT"SAVING ";F$
AB 880 A=BS:B=BS+(EA-SA)+1:GOS
       UB 920:SYS DEC("EA18"):
       PRINT"{DOWN}{BLU}** TAP
       E SAVE COMPLETED **":GO
       TO 220
CP 890 SYS DEC("E99A"):PRINT:I
       F PEEK(2816)=5 THEN GOS
       UB 950:PRINT"{DOWN}
       {BLK}{RVS} FILE NOT FOU
       ND ":GOTO 220
GQ 900 PRINT"LOADING ...{DOWN}
       ":AD=FNAD(2817):IF AD<>
       SA THEN F=1:GOTO 800:EL
       SE AD=FNAD(2819)-1:F=-2
       *(AD<EA)-3*(AD>EA)
JD 910 A=BS:B=BS+(EA-SA)+1:GOS
       UB 920:SYS DEC("E9FB"):
       IF ST>0 THEN 800:ELSE 7
       90
XB 920 POKE193,FNLB(A):POKE194
       ,FNHB(A):POKE 174,FNLB(
       B):POKE 175,FNHB(B):RET
       URN
CP 930 CATALOG:PRINT"{DOWN}
       {BLU}** PRESS ANY KEY F
       OR MENU **":GETKEY A$:G
       OTO 220
MM 940 PRINT BE$"{RVS} QUIT
       [4]";RT$;"ARE YOU SURE
       {SPACE}[Y/N]?":GETKEY A
       $:IF A$<>"Y" THEN 220:E
       LSE PRINT"{CLR}":BANK 1
       5:END
JE 950 SOUND 1,500,10:RETURN
AF 960 IF ER=14 AND EL=260 THE
       N RESUME 300
MK 970 IF ER=14 AND EL=500 THE
       N RESUME NEXT
KJ 980 IF ER=4 AND EL=780 THEN
        F=4:A$=DS$:RESUME 800
DQ 990 IF ER=30 THEN RESUME:EL
       SE PRINT ERR$(ER);" ERR
       OR IN LINE";EL
```


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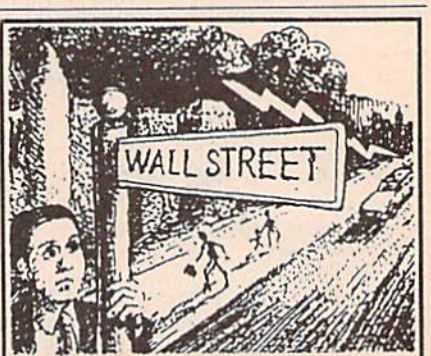

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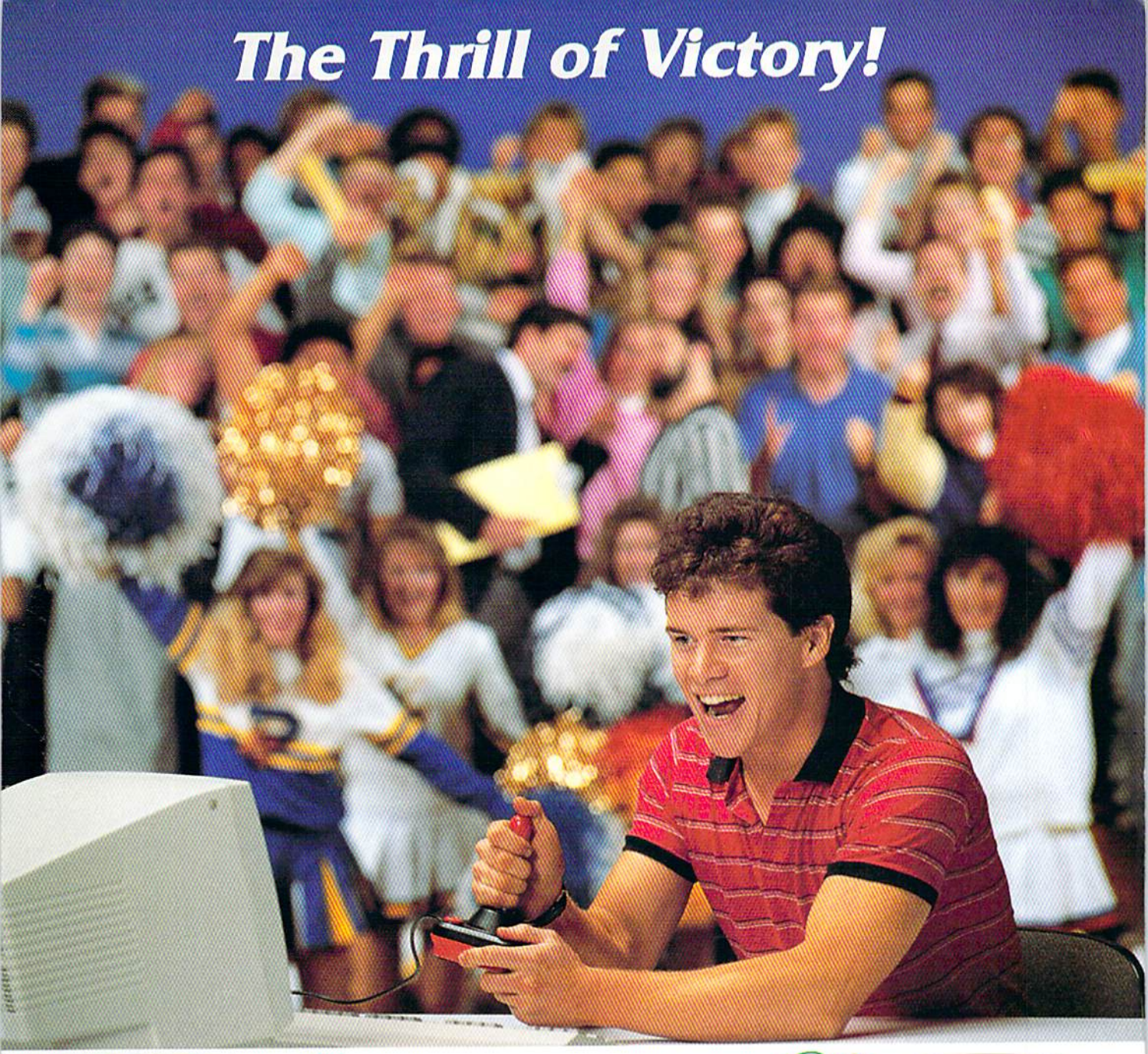

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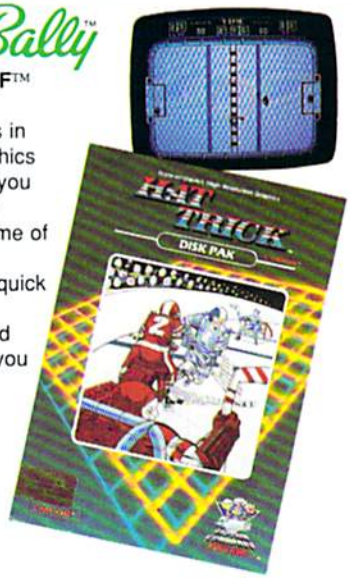

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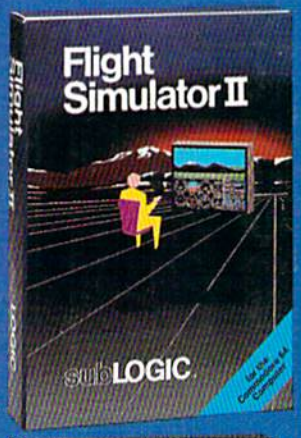

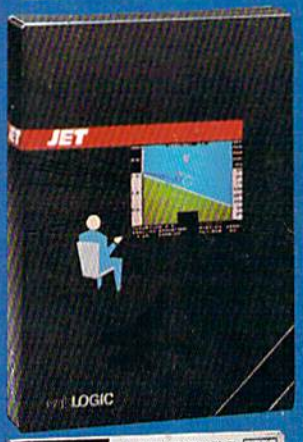

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